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TRADE AGREEMENTS ON 'KNOW-HOW' DISCUSSED

Moscow KHOZYAYSTVO I PRAVO in Russian No 6, Jun 83 pp 72-74

/Article by A. Mel'nikov, senior expert in the Contractual-Legal Administration of the Ministry of Foreign Trade: "Agreement on Transmission of 'Know-How'"/

/Text/ Under the conditions of the present scientific and technical revolution the thirst for possessing advanced production experience and knowledge has led to a significant increase in the number of agreements on the transmission of "know-how"[1] as compared with license agreements, whose objects are patented scientific and technical achievements. According to some data agreements on the transmission of "know-how," as well as patent licenses with a simultaneous transmission of "know-how," now constitute about 80 percent of all the license agreements concluded in the world.

As a rule, the All-Union Litsenzintorg Association concludes agreements on the transmission of "know-how" in the USSR. A number of other foreign trade associations also conclude such agreements. In accordance with their charters they perform operations for the transmission of "know-how," when the latter form an integral part of agreements on the export or import of goods based on the products list of these associations.

An analysis of the terms of agreements on the transmission of "know-how" shows that the rights and duties of the parties to the agreement coincide in large measure with the rights and duties of the licensor and licensee according to the license agreement. Therefore, in the first place, the concept of the agreement on the transmission of "know-how" falls under the concept of the license agreement.

Soviet foreign trade organizations widely use the licence form of agreement for the transmission of "know-how." At the same time, it is used both during the transmission of "know-how" alone and in cases when it forms an integral

1. "Know-how" is unpatented technical, economic (commercial) and organizational knowledge and experience known to a limited circle of people and possessing an economic value.

part of the patent license agreement or accompanies the delivery of equipment and materials according to the basic contract. Usually, license agreements on the transmission of "know-how" contain the names of the Soviet scientific research and economic organizations considered the developers or owners of "know-how" and also contain clauses to the effect that these organizations grant the corresponding foreign trade organization the right to conduct negotiations on their behalf and to protect their interests at foreign markets.

Raising the question of the legal nature of the agreement on the transmission of "know-how," first of all, it is necessary to determine what relations are regulated by such agreements. An analysis of the terms of agreements concluded by Soviet foreign trade organizations shows that these agreements regulate the most diverse relations of the parties. Such an agreement can regulate relations, which according to internal Soviet legislation contain elements of contracts of sale, lease and hiring work and of other contracts. Soviet civil legislation subject to application to foreign trade deals does not contain provisions that would regulate "know-how" as a special institution of law. In this connection, pursuant to article 4 of the Fundamentals of Civil Legislation, the agreement on the transmission of "know-how" can be included in the category of special kinds of agreements.

The fact that, as a rule, this agreement is concluded in two stages should be considered its specific feature. At the stage of preliminary negotiations, considering the lack of protective documents for "know-how," as well as the need to convey certain confidential information concerning the essence and economic efficiency from its introduction to the potential licensee, usually, a preliminary written agreement is formulated between the owners of "know-how" and the potential licensee on the nondisclosure and nonuse without the owner's permission of information of a confidential nature, access to which can be obtained in the course of preliminary negotiations. The need for the conclusion of a preliminary written agreement is due to the fact that in the course of preliminary negotiations the potential licensee can receive a certain part of professional secret information, which makes it possible to establish the approximate nature of "know-how" and to determine the economic effect from its introduction. At the same time, the potential licensee subsequently can refuse to conclude the agreement owing to financial difficulties, changes in market conditions, refusal of competent official bodies to issue an import license and so forth.

The conclusion of such a preliminary written agreement on the nondisclosure and nonuse without permission of the confidential information obtained in the course of preliminary negotiations is considered an effective method of protecting the rights of interested people to "know-how," because in case of violation of the terms of agreement they can submit this document to the court or arbitration tribunal as the basis for compensation for the damages caused them. In such an agreement there can also be a previously stipulated sum, which the potential licensee should pay to the owner of "know-how" in case of violation of the terms of agreement. Usually, it contains a term to the effect that the entire information transmitted to the potential licensee will be considered transmitted pursuant to the agreement if it is concluded by a specific period.

Terms regulating the definition of the object of agreement, methods of transmitting "know-how," preservation of confidentiality by the parties, limitation of the application of the object of agreement, mutual exchange of refinements in the object of agreement, guarantees and procedure of effecting payments can be included in the basic terms of agreement.

When concluding an agreement on the transmission of "know-how," first of all, it is necessary to define the object of agreement. An accurate definition of the object of agreement enables the parties to avoid different interpretations of their duties in the process of execution of the agreement and, in case a dispute arises, enables the judge or arbitrator to substantiate the motives for the decision on the basis of a clear declaration of intentions by the parties. The parties often include a preamble in the agreement, in which the intentions of the parties are determined and the meanings of the terms used in the agreement are cited. The existence of the preamble contributes to minimization of the possible differences in the interpretation of the duties of the parties to the agreement.

The description of methods of transmitting such a complex object of agreement as "know-how" is one of the key terms of agreement. Usually, two basic methods of transmitting "know-how" on the basis of an agreement are used in international commercial practice:

a) transmission of technical documents, sketches, instructions, descriptions, manuals, samples, models and other documents and objects;

b) training by the licensor of the licensee's personnel at the licensor's or licensee's enterprises.

The basic terms of agreement also include the term on the preservation of confidentiality with respect to the object of agreement. It seems that this term should be inherent in the agreement on the transmission of "know-how," because without it it is impossible to preserve the secret nature of information. The responsibility for the preservation of confidentiality with respect to the information transmitted according to this agreement rests mainly with the licensee. However, in cases when the agreement has a term on an exchange of refinements in the object of agreement, such a duty is imposed on a reciprocal basis both on the licensee and the licensor. In the contractual practice of Soviet foreign trade organizations, usually, confidentiality is ensured either by including in the agreement a clause on the confidentiality of all the information concerning the object of agreement, or by taking from the people who must be familiarized with the "know-how" transmitted according to the agreement a signed statement on the nondisclosure of the information obtained as a result of such a familiarization.

This agreement also includes terms limiting or regulating in some other way the sphere of application of the object of agreement. Usually, the application of the transmitted information is limited to a certain field of technology and to a certain territory and the use and sale of products produced by means of the "know-how" introduced at the licensee's enterprises are also limited to a certain territory. Furthermore, the agreement can contain a term limiting the licensee's right to the sale of finished products, or of their individual components, to a specific period.

The agreement should also regulate relations of the parties concerning a mutual exchange of refinements and improvements in the object of agreement. Usually, the agreement envisages the duty of the parties to immediately notify each other of all the refinements and improvements concerning the transmitted information made by them for the purpose of transmitting them on a priority basis to the other party to the agreement on a remunerative or nonremunerative basis.

The basic terms of the agreement on the transmission of "know-how" also include terms regulating the guarantees and responsibility of the parties. The licensor must guarantee primarily the fact that he, as the owner of the information transmitted according to the agreement, will ensure the protection of the object of agreement against possible claims by third parties, as well as the possibility of attaining the economic and technical indicators stipulated by the agreement. Of the licensor's other guarantees the guarantee of the quality and completeness of delivery of the documents and materials necessary for the licensee for the introduction of the object of agreement on the specified dates is applied most frequently. An accurate observance of the licensor's directives and instructions, as well as a high-quality manufacture of finished products produced with the use of the information transmitted according to this agreement, are considered the basic guarantees of the licensee. The latter guarantee is of special significance for agreements providing for the use by the licensee of the licensor's trademark.

Terms regulating the procedure of effecting payments according to the agreement on the transmission of "know-how" are of extremely great importance for the parties, because in case of a proper execution by the licensor of his duties the right to receive a remuneration becomes the basic right of the licensor and, in turn, the duty to pay for "know-how," the basic duty of the licensee. Soviet foreign trade organizations use in these agreements both the lump-sum form of payment and the form of periodic payments (royalties), as well as a mixed form (combination of the first and second form).

In addition to the basic terms examined above, usually, the agreement on the transmission of "know-how" contains clauses on taxes and charges and on the applicable law, force-majeure and arbitration clauses and terms on a conventional fine for a delay in the delivery of objects and documents stipulated by the agreement, on the periods of effect of the agreement, on patents, application for which the parties can formulate in the course of execution of the agreement, and on an immediate notification by the parties of each other on the possible claims by third parties. The enumerated terms are not of such a fundamental nature as, for example, terms defining the object of agreement or regulating the preservation of confidentiality. However, in a certain contingency a force-majeure clause or terms regulating the periods of effect of the agreement can acquire the same fundamental importance as the basic terms of agreement.

In addition to the enumerated basic and nonbasic terms, usually, the agreement also regulates other terms, for example, such as a bank guarantee of the payment by the licensee of sums subject to repayment to the licensor and terms on the consequences of a change in the legal status of the parties to the agreement and on the procedure of issue of sublicenses by the licensee, that is, terms applied in any license agreements regardless of what the object of agreement is--a patented invention or "know-how."

An analysis of the terms of agreements on the transmission of "know-how" concluded by Soviet foreign trade organizations shows that, on the whole, they ensure the protection of the interests of the Soviet party to the agreement. At the same time, there are some defects, especially in cases when "know-how" is not the object of a special agreement, but is transmitted on the basis of a contract for the delivery of complete sets of equipment.

There are cases when the object of agreement is not formulated quite clearly and "know-how" is defined either as "the salesman's knowledge and experience necessary for the installation, setting up and commissioning of equipment," or as "knowledge and experience necessary for the implementation of the industrial process in the field of production..."

Nonformulation of the transmission of "know-how" by a special appendix or supplement to the contract for the delivery of equipment is also practised. For example, in the contract of one Soviet foreign trade association the object of agreement was not defined at all and it was stipulated that "the equipment technical documents and 'know-how' necessary for the installation and commissioning of equipment" would be purchased from the foreign firm. At the same time, a unified price for equipment, technical documents and "know-how" was established. The lack of a clear definition of the object of agreement leads to considerable difficulties during price determination and can also give rise to different interpretations of the rights and duties of the parties to the agreement in the process of its execution.

There are also other defects in the formulation of the terms of agreement. In particular, when the methods of transmitting "know-how" are determined, the responsibility of the foreign party to the agreement for correct consultations given by the firm's personnel at the Soviet enterprises introducing it is not regulated quite clearly and the agreement does not always contain a clause on the applicable law, although it is exceptionally difficult for the parties to envisage directly in the agreement all the relations concerning such a complex object of agreement as "know-how."

This can be avoided if a standard agreement on the nondisclosure of the information that can be obtained in the course of preliminary negotiations, as well as a standard signed statement on the nondisclosure of information concerning "know-how" for the people that can receive this information in the process of execution of the agreement, is worked out in advance. It is also important, when concluding contracts for the delivery of complete sets of equipment, to formulate the transmission of "know-how" by concluding a special appendix or supplement to the contract.

When defining the terms of the agreement on the transmission of "know-how," inaccurate or general-type formulations, especially when introducing the basic terms of agreement enumerated above into it, should be avoided.

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MEASURES TO STEP UP PRACTICAL USE OF SCIENTIFIC WORK DISCUSSED

Tashkent EKONOMIKA I ZHIZN' in Russian No 5, May 8[illegible] pp 32-36

[Article by V. Khodzhimatov, chief, administration of science and technology of UzSSR Gosplan: "Some Problems in Integrating Science and Production"]

[Text] To achieve significant acceleration of scientific-technical progress and bring all sectors of the economy to the most advanced frontiers of science and technology--this task was proposed by the 26th CPSU Congress as one of the paramount tasks of our time.

Much has been done by scientists of Uzbekistan for the development of the multisectorial economy of the republic and for the creation of progressive technology in industry, capital construction, and in agriculture, especially in cotton production.

Every year scientific organizations complete and turn over for practical use more than 33 different development projects with an economic impact of more than 600 million rubles. Thanks to their introduction, technical equipmentation has grown, technological processes have been improved, the volume of production has increased, and the quality of output has improved in the republic's electronics industry, at the Tashkent Chkalov Aviation Production Association, the Bekabad Metallurgical Combine, the Tashkent Traktornyy Zavod Production Association, the Navoy Mining-Metallurgical Combine, the Namangan Silk Fabrics Combine, and many other enterprises of the republic.

Here are some findings from a recent analysis of the use of scientific achievements at enterprises of six ministries in the republic: meat and dairy, food, local, furniture and wood processing industry, building materials industry and Uzstroydrevprom [possibly UzSSR Construction and Lumber Industry Association]. They conclusively confirm the stimulating influence of scientific recommendations on the growth of labor productivity and production volume. Thus, as a result of the introduction of 50 scientific development projects in the system of the Ministry of Local Industry in the past two years the prime cost of output decreased by 2.4 million rubles, labor productivity rose by 12.3 percent, and the number of manual laborers was reduced by 1,500 people. The economic impact produced

in the Ministry of Meat and Dairy Industry by introduction of 72 scientific development projects in the same period was 1.2 million rubles. On the same basis labor productivity at enterprises of the Ministry of Building Materials Industry rose 4.3 percent and at Uzglavstroydrevprom [possibly UzSSR Main Adminstration of Construction and Lumber Industry] it went up 12.2 percent.

The largest share of the development projects being performed by scientific organizations in the republic involves timely problems of development of the cotton complex, primarily cultivation and increasing the yield and quality of raw cotton. In recent years many strains of the cotton plant have been bred and regionalized by our plant breeders: An-402, Kyzyl-Ravat, Tashkent-6, Andizhan-2, Samarkand-2, and others. The use of these strains promoted high cotton yields and fulfillment of state plans and the republic's socialist obligations for procurement of cotton.

Research in the areas of agricultural engineering, chemical technology, and mechanization of cotton production has been effective. Results have been most fully realized in the Tashkent industrial technology for cultivating and harvesting cotton. Application of this technology insures early maturation of the plants and machine harvesting of the crop in short periods of time.

Scientists' development work has been even more fully employed in developing integrated and biological methods and means for protecting plants from pests and diseases. Presently they are being applied on more than 2 million hectares of cropland. On the basis of scientists' recommendations work is successfully being conducted on lowering the toxicity of preparations with which crops are treated.

Much has been done by scientific organizations to mechanize the processes of cultivation, harvesting, preparation, and primary processing of raw cotton. A number of machines have been developed whose introduction has made it possible to increase the level of mechanization of the primary tillage of cropland up to 100 percent, seeding and plant cultivation up to 88 percent, and harvesting of the cotton crop to more than 63 percent. At the present time machines, which have no match abroad, have been built and are being introduced for harvesting fine-fiber varieties.

Studies are being successfully conducted, aimed at raising the yield and increasing production of grain, rice, vegetable and melon crops, potatoes, and other agricultural crops, and also in the areas of silk production, animal husbandry, and other sectors of agricultural production.

The contribution of scientists to solving problems of construction, water management, and environmental protection is appreciable; they are working out economic problems and conducting fundamental research in the natural and social sciences.

The 7th Plenum of the Central Committee of the Uzbek Communist Party devoted a great deal of attention to introducing a target program method of planning and organizing work on the development of science and technology.

Scientific, planning-design, and technological development work is being done in the republic for assignments envisioned by more than 80 USSR and 19 republic comprehensive target programs. These programs encompass almost all the most important problems of scientific-technical progress in the basic sectors of the economy of the country and republic; they are dictated by the tasks of the uniform state technical policies. USSR programs aimed at solving problems in using solar energy and developing non-ferrous metallurgy, geology, chemistry, agricultural machine building, animal husbandry, and primarily, of course, cotton production, are especially significant for the republic.

More than 150 scientific, planning-design, and productions organizations are fulfilling more than 800 assignments in accordance with comprehensive programs. More than one-third of them are already completed. Among them, for example, is development of a technological system and parameters of the class KhNP-1.8 cotton harvester with an improved cleaner and pneumatic pickers and a single bunker, and development of a technological system for harvesting, loading and unloading, and transporting raw cotton in containers. Four assignments have been completed by the UzSSR Academy of Sciences' Institute of Nuclear Physics; in particular, they have completed development, manufacture, and introduction of the Shakhta-Bunker complex of monitoring equipment with an expected economic impact of 250,000 rubles. Five assignments have been completed by NIIstromproyekt [possibly Scientific Research Institute of Building Materials Design]; one of them is development of technological means of modernization of shaft furnaces with an increase in productivity of 2-2.5 times and a decrease in fuel consumption. The Silikat NPO [Science-Production Association], working on an assignment, launched production of silicate cement using low-temperature technology (the economic impact was 632,000 rubles in 1982). TashZNIIEP [Tashkent Zonal Scientific Research and Planning Institute for Standard and Experimental Planning of Residential and Public Buildings] proposed a means of utilizing the heat of exhaust gas with an expected economic impact of 675,000 rubles. The Signal NPO completed developement of technical documentation for manufacture of and experimental model of a portable mining thermal anametrical indicator and gas discharge register (Tair-5) with an expected economic impact of 720,000 rubles. Many other assignements have also been fulfilled which are significant for subsequent stages of work on the comprehensive programs.

In a single article it is difficult to outline the whole range of scientific potential in the republic, to show the inexhaustible possibilities of its use in sectors of the economy. It is much more important today to present a discussion about realization of the possibilities, about the speed with which they are being materialized, introduced, and used in production.

"If we in reality want to advance the cause of the introduction of new technology and new methods of labor," General Secretary of the CPSU Central Committee Comrade Yu. V. Andropov said at the November 1982 Plenum of the CPSU Central Committee, "it is necessary that the central economic organs, the Academy of Sciences, the State Committee for Science and

Technology, and the ministries not simply propagandize them, but identify and eliminate particular difficulties which hinder scientific-technical progress."

Practical application of scientific recommendations is being held back by the fact that there are still many defects in the economic mechanism for introducing research and development.

Experience has shown that the situation today where some organizations carry out scientific research, others do design development and manufacture of experimental models, and yet others work out technology does not fit either the higher level of productive forces or contemporary forms of production organization. This leads in particular to unjustifiably long periods of development for new types of machinery and technology. For the country as a whole, the time required to develop and transfer technical documentation to production is about 5-6 years. From making the decision to develop a new type of output to its series manufacture takes 7-8 years. It often happens that because of this, new machines become obsolete even before organization for mass production. Under conditions of accelerated scientific-technical progress the significance of this factor continues to increase.

Retardation of the "science-to-production" process is further explained by poor provision to scientific research and planning organizations and experimental production facilities of equipment, instruments, tools, and means of automation for conducting scientific research, and by the lack of a sufficient quantity of assembly components.

We cannot help mentioning also the shortcomings in management and planning of scientific-technical progress. A serious obstacle is the lack of interest of the ministries and departments in priority fulfillment of plans for developing science and technology. In addition, we have not managed to overcome the fragmentary nature of plans in science and technology and inadequate coordination of them with other sections of the plans for economic and social development.

Considerable organizational-methodological work by party, Soviet, and economic organs is imperative for further improvement of the mechanism of planned management of the given process, efficient integration of science and production.

Above all, we must, it seems, use practical existing possibilities to the fullest degree to satisfy the requirements of production for scientific and technical output.

We will begin with how widely and reliably possible consumers are acquainted with scientific and technical innovations. Such knowledge is brought about today by the system of scientific-technical information, through information lists, bulletins, reference collections, journals, and the like. With such forms of information time losses are 1-1.5 years.

It appears that precisely in this intersecting phase a bottleneck has occurred; informational material about development projects proposed for technological incorporation, material which each particular sector of the economy should in principle have at its disposal, turns out to be incomplete and often late.

Under these conditions we can achieve the greatest clarity about scientific-technical capabilities available at the given moment by setting up funds of completed developments (FRG) on the start-to-finish principle in all major elements of sectorial administration in the national economy. The formation of such a fund is expected to provide collection, storage, systematic updating, and addressed distribution of the essential information about completed developments and also scientific-technical and to enterprises and associations in utilizing the innovations. It should be a component part of the mechanism of introduction and should clarify the current situation with results of scientific research from scientific research and planning-design organizations of a particular ministry (department) as well as from academy institutions and nonsectorial institutions of higher learning.

In recent years centralized planned influence on acceleration of introduction processes has intensified notably. The national economic plan of scientific research, aimed at solving fundamental scientific-technical problems and oriented to final results, has become an effective instrument today, providing close integration of science and material production. At the same time reserves for using planning methods are far from being exhausted.

It is imperative that we create a republic automated system of management for scientific-technical development, planning calculations in science and technology, and managing formulation and realization of key programs. The ASU will also include a center for exchange of current information on scientific development projects underway and subject to introduction.

Financing scientific research and experimental design work by subject through the schedule-order system is expected to become an important economic lever, providing close cooperation between science and production. This system is an effective instrument for target planning which allows concentration of financial, material-technical, and personnel resources on solving timely scientific-technical problems. Nevertheless, until now this progressive system has not been widely used in the republic.

Ministries and departments must improve coordination between plans for scientific research and experimental design work and sectorial development plans. In other words, they must formulate the subjects of scientific research and experimental design work on the basis of the requests of industrial enterprises, taking into account the long-term plan for technical-economic development of the sector. In light of this, formulation of plans for scientific research and experimental design work should rely on extensive information about scientific-technical development projects both in this country and abroad, which requires an increase in the level of work by patent-license services. An important step in applying the schedule-order system would be the creation of problem-oriented sectorial laboratories in academy institutions, completely financed by sectorial ministries and departments.

An increase in the efficiency of scientific research is closely linked to improving planning of economic contract work. The foundation for formulating the subjects of economic contract work for ministries and departments should be the principle of developing long-range comprehensive national economic programs at specific sites. Therefore, it is expedient to conclude economic contracts for large sums and long time periods.

Today the process of introducing scientific-technical advances into production has become very complicated, which also presupposes certain organizational changes in management structure. This finds its concrete reflection in the practice of setting up science-production associations (NPO's) and transforming traditional scientific research institutes into multidisciplinary scientific institutions which perform not only research but also experimental design and planning-technological work. Sectorial institutes have in reality become scientific-engineering subdivisions of ministries (departments) whose main function is the introduction of new machinery and technology into production. In the near future one can fully expect that institutions will appear in the republic which are narrowly specialized in the introduction and dissemination of scientific-technical achievements in sectors of the economy.

Nevertheless, all organizations where the predominant function is introduction of completed scientific research and experimental design work suffer from one common shortcoming--the absence of a comprehensive national economic approach.

Life demands that scientific research be more closely tied to the fundamental directions and concrete needs of socioeconomic development. Scientific development projects must be more vigorously oriented toward comprehensive target problems. Such national economic tasks as the continued search for new raw material resources and development of the major comprehensive science-production programs for "Water" and "Labor Resources" have national significance. Every year environmental protection issues become more important. As before, the problem of building up energy resources remains timely; this means that, in addition to identifying new deposits and increasing the extraction of gas, oil, and coal, scientists of the republic must continue working together with power engineers to use solar energy.

The republic has to put into practice an extensive program of economic intensification based on acceleration of scientific-technical progress. The main things here are fundamentally new scientific ideas and technical concepts and concentration of forces on the key areas of the economy. And here once again I would like to emphasize the significance of target-program management methods. We have already spoken above about those comprehensive scientific-technical programs for solving key regional problems which are successfully being conducted in the republic. But an even deeper analysis of the implementation of these programs enables us to conclude that everywhere we must surmount certain obstacles when including particular sections of a program in the plans of sectorial scientific, planning-design, and technological organizations. Obviously, the time has come to codify in law target financing of such programs and to set up a single coordinating center in the republic.

Another aspect of the issue we have touched upon is the necessity to further expand the scale of application of comprehensive target programs. Even given the above-mentioned shortcomings, their application contributed to a certain degree of success in surmounting the existing lack of coordination in academy, VUZ, and sectorial science as well as other components of the "science-to-production" system. In addition, the subjects of scientific research being carried on in the republic show that there are real opportunities for significant expansion of the subjects being developed within the framework of comprehensive target programs.

In virtue of the fact that comprehensive programs are directive planning documents, they should envision a set of measures coordinated by resources, performers, and performance times of the work being planned relating to various spheres of activity. These jobs must be done in order to solve key scientific-technical problems and to achieve broad use of these achievements in the national economy. Their final result should be subordinated above all to the planned development of productive forces and increasing production efficiency.

12,424
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EFFECTS OF SCIENCE, TECHNOLOGY ON STRUCTURE OF PRODUCTION PROCESS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA EKONOMICHESKAYA in Russian No 3, 1983 pp 40-52

/Article by Ye. A. Skoblikov: "The Scientific and Technical Revolution and the Development of Production Systems"/

/Text/ The article considers the structure of the production process, patterns in its organization and the classification of production processes. On the basis of an analysis of the dialectical interconnection among stages of the production process--preparation and direct production--and the singling out of the type of production systems and the stages of their development, the organizational content of the scientific and technical revolution is determined. Practical recommendations are given for improving the organizational structure of industry.

An awareness of the essence of the scientific and technical revolution is extremely important for forming the strategy and tactics for managing the national economy. Even today we have not yet solved problems whose answers are required in order to effectively control the economy: how to combine the results of science, technology and the available labor resource most effectively under the conditions of the scientific and technical revolution. But scientific study of modern production has not yet advanced so far as to provide a reliable reflection of the peculiarities of its organizational structure.

The essence of the scientific and technical revolution and its organizational content are conditioned largely, as will be shown below, by the changeover from one type of production system to another. But this circumstance has still not attracted the attention of scientists either when investigating production systems or when analyzing the peculiarities of the modern scientific and technical revolution. Thus the majority of researchers relate the essence of the scientific and technical revolution to one or another new direction in science and technology--automation, the use of chemicals, the conquest of space and so forth--or they characterize it as a complex of these areas. For example, G. Volkov thinks that automation constitutes the essence of the interpenetration of science and technology and material production /5/, thus defining it as the basis for the development of all other areas.

If one recognizes that the essence of the scientific and technical revolution is one of the areas of science and technology, basic efforts should be concentrated on those forms of activity which provide for priority development of this area and its penetration into all aspects of production activity. But a careful economic substantiation of innovations taken as a mass of specific instances and certain conditions of production will show that not a single one of the aforementioned areas, including automation, is universal. "The existing methods of automation do not make it possible to replace man in what would seem to be the simplist operations, or this replacement involves very great expenditures" [6, 1982, No 10, p 47]. Thus a purely economic statement of the problem shows that the essence of the scientific and technical revolution cannot be any individual area of it. Automation, the penetration into space, the introduction of biological laws and so forth finally present what appears on the surface to be the scientific and technical revolution, its consequences, but not the internal, motive source and the reason for its appearance.

The political and economic definition of the scientific and technical revolution as a revolution in the structure and dynamics of the productive forces of society (see, for example, [5, p 227]) is the closest to the truth. But its excessively general nature does not make it possible to utilize it in concrete administrative practice. And the pivotal point of this revolution, as K. Marx foresaw, is the transformation of science into a direct productive force. But does the forced application of science, "scientization" of substantial and personal elements of productive forces, lead to the corresponding increase in the effectiveness of production?

Common views about scientific and technical progress proceed from the idea that the more one spends on science, the higher the level of education of youth and the more money is allotted for increasing skills, the greater the efficiency of production. It is difficult to arrive at a different opinion if people everywhere are always talking about the great effectiveness of science, about the fact that investments in science produce up to 10 rubles in profit per ruble of investment, while investments in production produce an average of 15 kopecks, and so forth. For example, during 4 years of the 10th Five-Year Plan, for each ruble invested in applied developments of the Ukrainian SSR Academy of Sciences they obtained more than 5 rubles in profit [6, 1981. No 3, p 9]. With relatively separate scientific and technical decisions this is indeed true. But in general an entirely different picture emerges. Let us try to illustrate it with figures.

In 1980 as compared to 19?0 capital investments in the country's national economy had increased 9.2-fold, including 10.6-fold in industry, while investments in the construction of institutions of culture, art, science and public education increased 14.7-fold [7, 1922-1982, p 369; 1965, p 531; 1960, p 594]. Expenditures from the state budget and from other sources on education and science during this period increased 9-fold, including in science--22.3-fold [7, 1922-1982, p 564; 1970, p 732]. If the average annual growth rates of the number of workers and employees employed in the national economy during the past three decades amounted to 5.9 percent, including industrial production personnel --4.7 percent, in science and scientific services these figures were three times higher and amounted to 17.1 percent [7, 1980, pp 357-358; 1965, pp 558, 559].

Even today our country has the greatest scientific potential in the world and has the most developed network of scientific research and design organizations.

But the more rapid investments in science and education were not reflected in an essential way directly in the efficiency of production. Since the effect of investments in these areas of activity have a considerable lag,* in the 1970's one could expect rapid growth of the country's economy. But in reality the average annual growth rates of the national income and the productivity of public labor during the past decade were lower than in the 1960's, and in the 1960's they were lower than in the 1950's [7, 1980, pp 41-42; 1975, pp 49-50].

	Average annual growth rates, %		
	1951-1960	1961-1970	1971-1980
National Income	16.6	9.9	6.2
Productivity of Public Labor	13.4	8.2	4.6

The difference in labor productivity in industry of the USSR and the United States decreased by only 2 percent during the last decade. The productivity of public labor in the USSR as compared to the United States in 1975-1980 remained at the level of 40 percent (two-fifths). Labor productivity in agriculture during the past 3 five-year plans was one-fourth-one-fifth that of the United States [7, 1922-1982, p 92; 1975, p 121; 1980, p 60; 1970, p 82].

Do the figures that have been presented cast doubt on the correctness of the fundamental theoretical conclusion that science is a motive force of progress? Not at all. Science has been, is and will be the main direction for growth of the country's economy. The figures that have been presented show something else. The organization of science itself has not been perfected and its contribution to the final results of production is decreasing.** Western firms, for example, in machine building, with volumes of assimilatio f new technical equipment comparable to those in the USSR and similar production volumes require one-third-one-fourth the number of designers and researchers [9]. But the poor efficiency of the labor of those who are primarily responsible for the effectiveness of production characterizes only one aspect of the process, and not the main one. In a certain stage of the development of production there comes a time when purely quantitiative growth of scientific and technical potential, without profound qualitative transformations, produces results that directly contradict what is expected.

*V. I. Jushlin considers the lag between expenditures and the effect from scientific research work to be 8 years [8].

**While in 1965 for each scientific worker and engineer there were 6.1 and 2.5 innovation proposals, respectively, in 1978 there were 3.9 and 1.1. The number of models of new technical equipment per creative worker is also decreasing: per 10,000 scientific workers and engineers in 1965 there were 7.0 and 2.8 new models created, respectively, and in 1979--2.8 and 0.8 [6, 1980, No 8, p 197].

Let us return to the political and economic definition of the essence of the scientific and technical revolution. While it is a revolution in the structure and dynamics of productive forces and the transformation of science into a direct productive force, the labor of scientists and designers and technologists who develop their ideas should be recognized as production. Hence the corresponding organizational forms for the functioning of science--scientific research institutes, design bureaus and organizations similar to them--should be recognized as an indispensible element of productive forces. But productive forces do not operate outside the production process. Yet up to this point the production process has been regarded only as a process of direct transformation of the object of labor. The material sphere of the application of science, represented by various forms of participation of science in production, engineering services of enterprises and associations, and so forth, is thus excluded, which makes it possible to arbitrarily interpret questions of ensuring an effective link between science, technology and production. In spite of the attempts of individual authors to show that the production process has a more complicated structure, the dialectical interconnection of various stages of the production process and above all the preparation and direct production still remain outside the realm of research.

Thus before approaching an analysis of the development of production systems and contradictions whose resolution conditions this development, it is necessary to investigate the structure of the production process and its patterns.

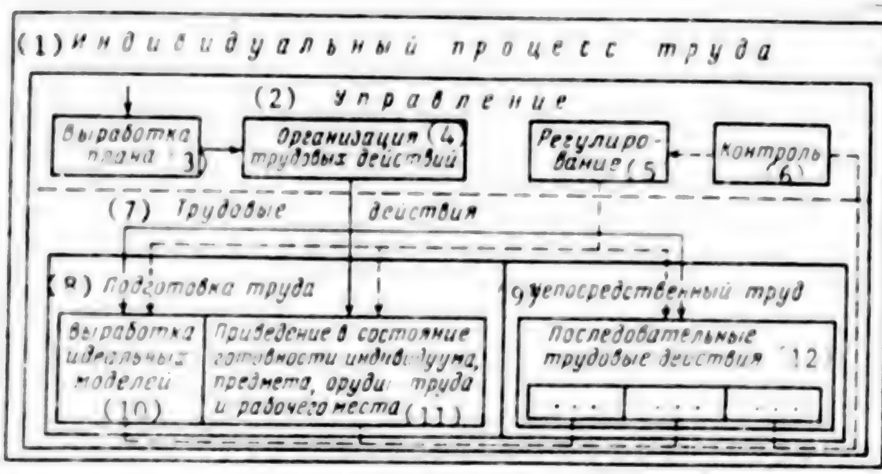

Figure 1.

Key:

1. Individual labor process
2. Administration
3. Development of plan
4. Organization of labor activities
5. Regulation
6. Control
7. Labor activities
8. Preparation for labor
9. Direct labor
10. Development of ideal models
11. Making ready the individuum, the object and implements of labor and working position
12. Subsequent labor activities

Any production process can be represented as an individual process of the labor of the total worker and can be initially regarded in this simple form* (Figure 1). Any individual labor process includes two stages--preparation for labor and direct manufacture of the product or direct labor. The preparation for labor includes the development of ideal models of the future product of labor and the process of developing the object of labor, and also making ready in keeping with these models the subject, material and implements of labor as well as the place of work. Thus even for an individual labor process, to equate it only to direct labor is not in keeping with its real structure.

The production process as an individual process of the labor of the total worker has the same structure, but it is more developed. It also consists of two stages, but these are at the level of production processes--preparation of production and direct production. It is thus more complicated to arrange the structure of both stages.

Direct production includes three phases: procurement, processing and assembly. It has been sufficiently revealed in existing economic and technical literature, and therefore there is no need to discuss these descriptions here.

As for the first stage, on the contrary, there are no "sufficiently precisely developed theoretical points that reveal the essence of the preparation for production and its structure" [10]. There is typically a tendency toward an expanded interpretation of the preparation for production which includes any processes if they are not accomodated by the classifications of production or administrative processes that are proposed by the author.

An analysis of the individual labor process makes it possible to delimit clearly enough the processes of preparation for production from the auxiliary production processes (which, in turn, also require preparation), processes of circulation, service, selection of personnel, and so forth. In the first place, all work for creating models of the product and the method of manufacturing it which provide an ideal reflection of the future production process is included as part of the preparation for production: conducting scientific research and experimental design work (NIOKR), and design, technological and economical-organizational preparation for production. In the second place, it includes all work related to making the production system ready or introducing it; for a new enterprise this includes startup work and reaching the planned capacity.

The stage of preparation for production, like direct production, is divided into three phases: the performance of NIOKR, technical and economic preparation (TEPP) and its introduction. Let us consider briefly the content of each of these.

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*K. Marx wrote: "Labor seems to be quite a simple category. . . . But 'labor' regarded economically in this simple form is just as modern a category as the relations that give rise to this simple abstraction" [1, Vol 12, p 729].

The first phase--NIOKR. The goal of this phase is to search for new ideas both for the design and the method of manufacture, including the solutions to various economic and organizational problems in production. This phase ends with the manufacture and testing of experimental models of the items or new technology, or, if NIOKR is conducted as part of the economics and organization of production, the approval of the recommendations, methods or instructions.

The second phase--TEPP. This is the main phase of preparation for production since its result is the reflection of the future production process in technical and economic documentation.

The first stage of TEPP is design preparation for production which when carried out, as distinct from experimental design work, has the main problems of selecting effective materials and batching items, taking into account the possibilities of satisfying the needs for them with mass production, and also ensuring the technological viability of the design.

Technological preparation of production is the second stage in TEPP. As a result of it, an ideal model of the means of producing the item is created. Therefore it cannot include, as is generally thought, the development and manufacture of fittings and nonstandardized equipment. The latter are an independent production process which is divided in the same way into preparation for production and direct production.

The second stage is completed with economic and organizational preparation for production. If the results of the first and second stages are models of the creation of the consumer value of the item, the result of the last stage is a model of the creation of this value. The following processes are carried out in this stage: the drawing up of normatives of material and labor expenditures, the calculation of production capacities, the determination of the need for materials, energy and labor resources, the development of the organization of production and administration (organizational plans), the drawing up of estimated expenditures and planning calculations, the calculation of economic indicators, and so forth. It is precisely in this stage that one reveals the results of all the preceding work for preparation for production.

The third phase--introduction. In this phase the production system is made ready for new production. It includes: completing technical and economic documentation, solving problems of financing and capital construction, concluding agreements with suppliers and consumers, acquiring new equipment and installing it, manufacturing fittings and testing them, and adjusting technical and economic documentation on the basis of changes in production conditions that have taken place during the time of preparation. An important stage in introduction is the selection and training of workers in keeping with the specific features of the future production.

The stage of preparation for production has been shown here in a general form. In reality the content and volume of work in it will differ, depending on the specific features of the branch, the kind of product produced, the scale and organization of production, and so forth. Moreover, the process of preparation does not necessarily contain all phases if, for example, only a new technology

is being produced or production organization is being changed, new normatives are being introduced, and so forth. It is typical of undeveloped production that a considerable proportion of the decisions regarding preparation for production are made when direct production begins, and many of them are placed on the shoulders of the workers who are employed in the manufacture of the commercial product.

Direct production, regardless of the completeness and quality of the preparation, can begin only after this phase is completed, that is, when the means of production and the labor force are ready for functioning. "And so in the process of labor man's activity, with the help of means of labor, causes a previously earmarked change in the object of labor (italics mine--Ye. F.)" [1, Vol 23, p 191].

Thus the structure of the production process in general can have the form presented in Figure 2.

But an understanding of the structure of the production process is still not enough for effective control of the interaction among science, technology and production. It is also necessary to know the mechanism of the effect of laws of development and the functioning of production systems. Otherwise our actions can be directed against this development and can impede it. As will be shown below, it was precisely because of this that the effectiveness of science and its influence on production decreased.

The general laws which govern the structuring and the course of the production process are concentration, division, inseparability, proportionality, continuity and rhythm. These laws do not operate in isolation, but in interaction (Figure 3).

Concentration is an initial point in the development of processes of production and administration. This law was revealed by K. Marx when he analyzed the English factory system in 1857 (see [1, Vol 12, pp 193-199]) and it was subsequently investigated by V. I. Lenin. Their works give a description of the essence of this law and the forms of its manifestation, and they show the influence of concentration on other forms of production organization.

In turn "the collectivization of labor by capitalist production consists . . . in that the concentration of capital is accompanied by specialization of public labor . . ." [2, Vol I, p 177]. Concentration is thus a prerequisite for division of the production process into more specialized, isolated processes which are related to "the mass product, and therefore allow (or bring about) the application of machines . . ." [2, Vol I, p 95].

The degrees of concentration of production have been historically conditioned by the development of all processes, particularly division of labor. The latter, by making it possible to reduce labor expenditures, reduces the extreme limitations on concentration and prepares the soil for more of it. ". . . the arena of production is spatially narrowed as compared to the scope of production . . ." [1, Vol 23, p 340].

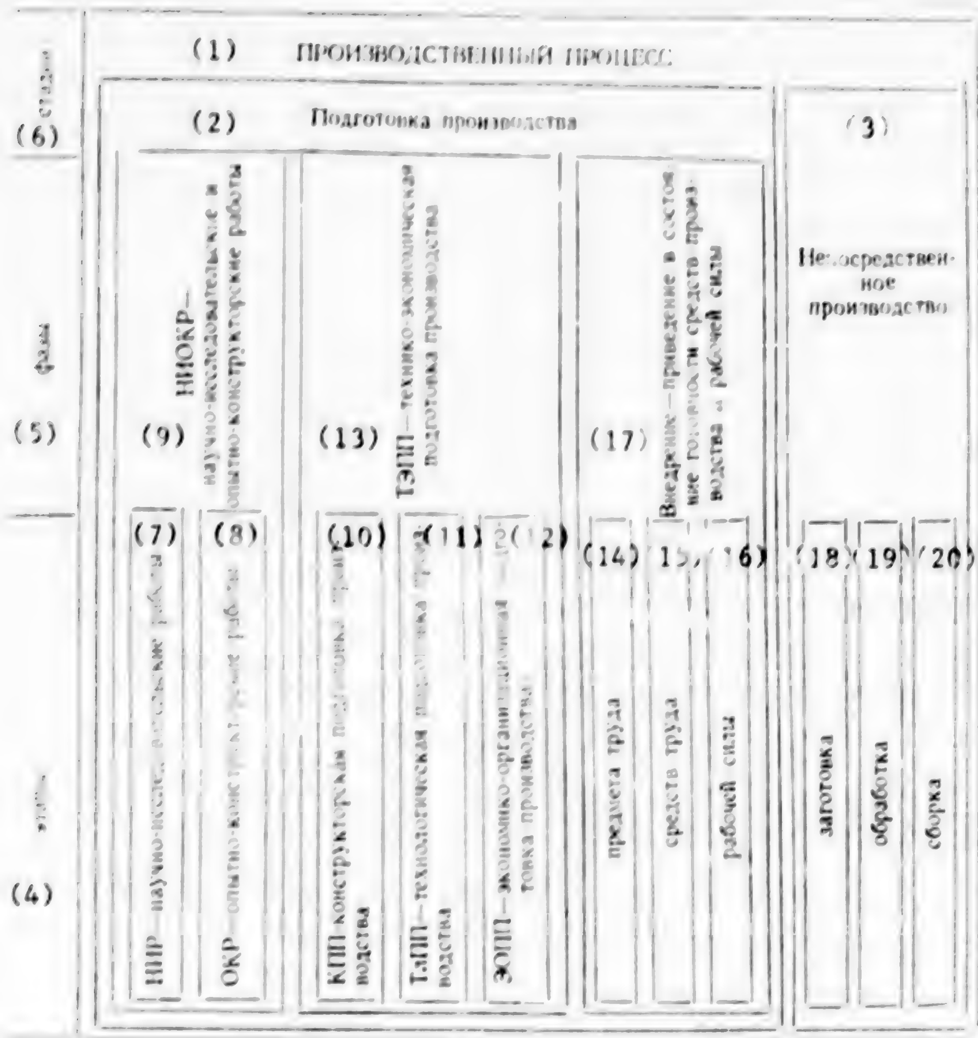

Figure 2

Key:

1. Production process
2. Preparation for production
3. Direct production
4. Stages
5. Phases
6. Periods
7. NIR - scientific research work
8. OKR - experimental design work
9. NIOKR - scientific research and experimental design work
10. KPP - design preparation for production
11. TIPP - technological preparation for production
12. EOPP - economic and organizational preparation for production
13. TEPP - technical and economic preparation for production
14. Object of labor
15. Means of labor
16. Labor force
17. Introduction - making means of production and labor force ready
18. Procurement
19. Processing
20. Assembly
21. Direct production

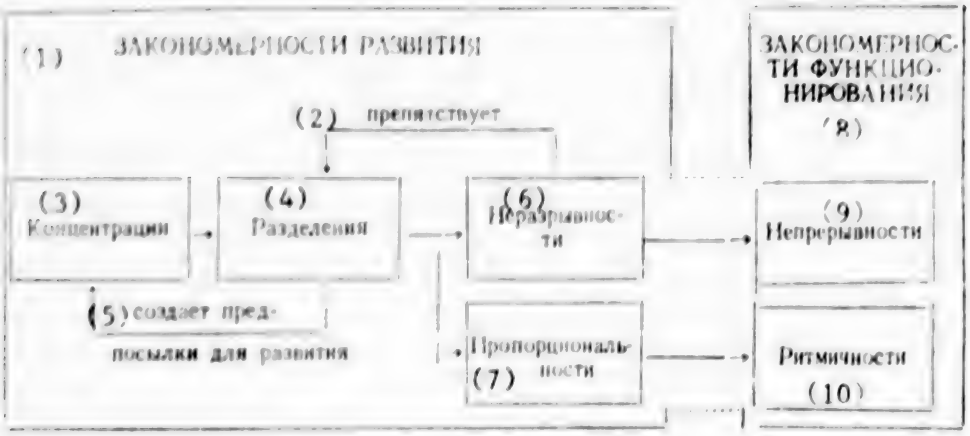

Figure 3

Key:

1. Laws of development
2. Impedes
3. Concentration
4. Division
5. Creates prerequesites for development
6. Inseparability
7. Proportionality
8. Laws of functioning
9. Continuity
10. Rhythm

But division violates the unity of the production process and gives rise to a contradiction among its elements that have become independent. Here another law comes into effect--inseparability. On the one hand it impedes division, sometimes causing a unification of previously separated parts of the process. On the other hand, inseparability requires that division be accompanied by the strengthening or creation of new ties among the separated parts.

Division of labor "along with qualitative breakdown . . . develops quantitative norms and proportions of the public labor process" /1, Vol 23, p 358/. Thus proportionality requires the establishment of a certain corelationship and coordination among separate processes.

Inseparability creates the necessary prerequisites for continuity which, according to K. Marx's definition "is itself a productive force of labor" /1, Vol 24, p 315/. In turn, continuity along with proportionality condition the rhythm of the processes. At the same time continuity and rhythm, because of a certain autonomy of effect, are factors that influence the manifestation of inseparability and proportionality.

The effect of these laws is manifested in different ways. A comparison of production systems and their homogeneous elements during one historical time interval or another reveal a steady growth of the degrees of effect of the law of concentration that is inherent in all of them. Division is manifested most frequently as potential, as the striving toward separation and unification of homogeneous elements and processes that precludes their duplication. And the

the effect of laws such as inseparability and proportionality can be observed only when there is already disproportion, when the process has actually been broken off or the interconnection among all of the parts is realized with great difficulty. ". . . proportionality (or correspondence) 'is presupposed' by the theory, but in fact, it is 'constantly being violated' . . ." /2, Vol 3, p 620/. Conversely, violations of continuity and rhythm are immediately reflected in the effectiveness of the production process and the forms of their manifestation are obvious.

The laws of organization of production systems are heterogeneous in their essence. Concentration, separation, inseparability and proportionality reflect a historical tendency, a trend, a stable order of interconnections of processes and therefore they are laws of development /11/. They are precisely what determine the arrangement of elements of the structures . . . their links. Continuity and rhythm, conversely, reflect the existing links among processes in a given time interval and therefore are laws of functioning. The degree of their utilization in the administration of production is determined by the effectiveness of the latter.

Laws of organization of production systems, like any others, are objective. Their effect is manifested, as was shown above, mainly through deviations and violations in the organization of processes of production and administration. These violations, as a rule, take form gradually and frequently go unnoticed. Nonetheless, their consequences are sometimes so serious that they can cause a breakdown of the production system or a radical reorganization of it. Hence the main task of administration consists in promptly eliminating disproportions and disruptions of the production process that have been noted.

Under the conditions of modern development of the economy, the increased urgency of such problems as the link between science and production and the acceleration of the introduction of the achievements of science into production show that the inseparability of the production process has been violated at the juncture of its stages--preparation and direct production, and that their proportionality and correspondence are not being observed.

Proceeding from Lenin's tenet that "development is a 'struggle' of oppositions" /2, Vol 29, p 317/, it is necessary to regard the preparation and direct production as a unity of oppositions, analyzing "how a known phenomenon (in this case, the production system--Ye. S.) has arisen in history, which major stages have taken place in the development of this phenomenon, and from the standpoint of this development, it is necessary to see what this thing has become now" /2, Vol 39, p 67/.

In the developed production process the unity and opposition of stages of preparation and direct production are characterized by the following main features.

1. Preparation for production without subsequent direct production amounts to useless, unrecouped expenditures of labor and money. The need for it must be completely determined by the needs of production. Additionally, the effectiveness of direct production is directly dependent on the quality and degree of preparation for production.

2. At the same time the processes of preparation and direct production are essentially directly opposed, if only in the aspect of mental and physical labor.* The main result of the preparation for production is an ideal reflection of the product and the means of manufacturing it, and direct production is a real thing, the product itself. Preparation is a one-time process, that is, it is carried out once during the entire cycle of the production of a given product, while direct production is a discrete process which is constantly being renewed and repeated. They take place in different time periods and the former always precedes the latter.

3. Various goals, results and times are objective factors that give rise to the contradiction between preparation and direct production. Its essence consists in the following. Increased efficiency of direct production requires careful preparation and, consequently, expansion (improvement) of this sphere of activity. But meeting these requirements violates stability and regularity of direct production. Hence there arises a need to limit the scope of preparation for production.**

Production moves from lower forms to higher ones as its internal contradictions develop and are reconciled. "Of decisive importance are the internal tendencies toward the destruction and restructuring of the system as a result of changes brought about by the struggle between contradictory internal tendencies" [12, p 51]. By analyzing the preceding development of production from the standpoint of the resolution of one of its main contradictions--preparation and direct production--one can single out two qualitatively different types of production systems: natural and industrial.

The natural type of production system is characterized by the fact that the worker himself has prepared for the process of production (here the individual labor process equals the production process) or, according to Marx, "the hand and the head are not separated" [13, p 22]. The first enterprises, cottage industries, were based on the natural type of production: although everyone worked together, each carried out preparation independently. But working together and increasing the purely quantitative changes gives rise to a new, qualitative aspect--there was a need for a higher level of production preparation. Thus concentration leads to the appearance of the contradiction between preparation and direct production. But it also creates prerequisties for resolving this contradiction: from the entire mass of workers it became possible to assign preparation processes to an individual, that is, the preparation began to be singled out into an independent kind of activity.

*K. Marx wrote that mental and physical labor "subsequently . . . part ways and arrive at a hostile antagonism" [1, Vol 23, p 516].

**G. A. Kulagin, in his book, gives this utterance of one well-known machine tool builder: "In France we have three ways of ruining an enterprise: the first is the quickest--when the manager is distracted by a card game; the second is the most pleasant--when he is distracted by women; and the third is the most reliable--when he has given unlimited free will to designers and researchers . . . Our enterprise has been ruined by the third method" [9, p 98].

Separating preparation for labor from direct labor marks a changeover toward a higher type of production system--industrial.

The increased sizes of enterprises makes it possible to create increasingly developed services for preparing for production. The constantly appearing contradiction between preparation and direct production is resolved here through progressive development of subdivisions for preparation with a simultaneous increasingly clear-cut separation of them from direct production. As time passes design-technological bureaus, research laboratories, testing and experimental productions appear at the enterprises, ". . . a deliberate technological application of science develops . . ." [2, Vol 1, p 173]. Thus the changeover from the natural to the industrial type of production constitutes the organizational content of the industrial revolution.

But each new separation of preparation from direct production has taken place within the framework of the enterprise, which has provided for maintaining the inseparability of the production process. Thus the industrial type of production system can be characterized as one in which preparation and direct production are carried out by the same enterprise but by various subdivisions of it.

At the beginning of the 20th century in industrially developed countries the contradiction between preparation and direct production reaches a qualitatively new level--it can no longer be resolved within the framework of an individual enterprise. The need for complicated, highly technical items which can be produced with reduced expenditures of labor and money required the development of preparation services that was incommensurate with the volumes of direct production, and the enterprises were not in a condition to provide for this without reducing their profit. Preparation became too large a project to be accomodated within the framework of the enterprise.

For the large firms and concerns that appeared by that time the scale of their production itself served as an objective basis for resolving the contradiction--subdivisions for preparation of enterprises for production were singled out and combined into scientific research laboratories or scientific and technical centers (NTTs) of the firms. Then the enterprises retained only small subdivisions for preparation whose functions were strictly limited to the current needs of production (see [14, p 125]). Thus there was a changeover to a new type of production systems--scientific and technical, which can be characterized as one wherein preparation and direct production are carried out by the same production association, but by more narrowly specialized production units.

Thus the changeover from the industrial to the scientific and technical type of production, and not any new direction for the development of science and technology or complex of these directions, comprises the organizational content of the scientific and technical revolution. This definition corresponds to and concretizes the political and economic definition of the scientific and technical revolution: it is precisely with the singling out (creation) of the NTTs as a production unit with equal rights that science first becomes a direct productive force, for organizationally it is included directly in the production process.

In the changeover from one, lower, type of production system to a higher one the effect of the law of negation of negation clearly reveals itself (Figure 4). ". . . The internal contradictions lead to a replacement of the old content with new and higher content" [2, Vol 29, p 88]. Each subsequent stage in the development of production systems is a higher level as compared to the preceding one. This identify also makes it possible to formulate a reliable crterion for the correspondence between production systems and the scientific and technical type of production--the structure of the production association should not represent a mechanical combination of the enterprises and organizations included in it, but should retain a similarity to the structure of the enterprise whose large subdivisions in this case would fulfill the role of production units. In this respect the structure of the Leningrad optical-mechanics association (LOMO) is to a certain degree classical--it has a NTTs, and the production units do not have their own services for preparation of production (except for shop services).

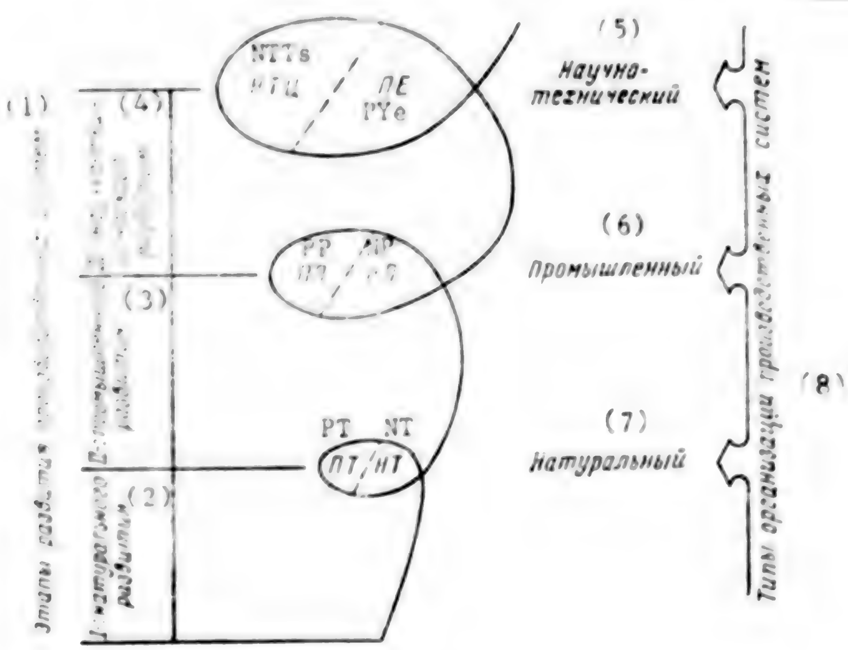

Figure 4

Key:
1. Stages in the development of production systems
2. I-: Natural development
3. II-: Industrial development
4. III-: Scientific and technical development
5. Scientific-technical
6. Industrial
7. Natural
8. Types of organization of production systems

But in our industries such associations as the LOMO are literally one of a kind. Under our conditions the resolution of the contradiction between the preparation for production and direct production has proceeded along a different path--the preparation for production has been centralized in a network of independent

scientific research institutes, design bureaus and similar organizations that have been created for this purpose. But such a separation of preparation for production was not based on production concentration and therefore the inseparability of the production process was violated. Under these conditions the link between preparation and direct production is realized indirectly, with incomparably greater expenditures of labor and money: 70-80 percent of the expenditures of the working time of scientists, designers and technologists goes for coordinating technical documentation, waiting for the introduction, and so forth. A proportional correspondence between preparation and direct production is achieved through disproportional hypertrophied development of the sphere of preparation for production.*

As D. A. Alakhverdyan and V. N. Slastenko note, in spite of the great significance of the law of concentration of production in the development of the socialist economy, its effects have not been well studied [15]. The same thing can be said about other laws of organization of production systems. But ignorance of these laws or a lack of understanding of the mechanism of their effect does not reduce the consequences of organizational decisions that do not correspond to them. As one can see from the figures presented in the article, the price that must be paid for reunifying a broken production process is inordinately high. Therefore in the organization of science and production today the main thing is to turn the course of the scientific and technical revolution back into its natural path, in other words, of primarily significance is the task of developing and improving the system of "science--production."

The party and the government are devoting serious attention to solving this problem. Thus, in keeping with the decisions of the 26th CPSU Congress, a decree was adopted by the CPSU Central Committee and the USSR Council of Ministers of 2 March 1973, "On Several Measures for Further Improvement of the Control of Industry," which envisions including scientific research and planning-design organizations in production associations. The 25th Congress pointed out the need to complete "the creation of associations and to continue work for concentration and specialization of production" [4]. The decree of the CPSU Central Committee and the USSR Council of Ministers of 12 July 1979 on improving the economic mechanism envisions "completing in the next 2-3 years the formation of production associations as the main autonomously financed unit of industry" [16].

Additionally, the "reunification" of science and production is taking place with great difficulty, and the changeover to a 2-3-level system of administration is being prolonged inadmissibly. In our opinion, two main obstacles have been encountered on the path to reorganization of the production structure and administration.

One of them was brought about by the fact that scientific research institutes, design bureaus and other independent organizations in the sphere of preparation for production, having received, however, the opportunity to function outside

*While our national income is two-thirds that of the United States, the USSR national economy employs 3.3 times as many certified engineers [7, 1975, p 120, 156; 1922-1982, p 91].

the process of production, have formed their own, relatively closed system. Now, when because of the changeover to the 2-3-level system of administration, there is a real threat to its existence, it, in keeping with the Le Chatelier principle, is restructuring its elements and ties and becoming organizationally stronger in order to actively oppose merging with production. According to data of general plans for 1977, many ministries, for example, have envisioned the creation of all-union production associations that join together mainly organizations for preparation for production (Table), which has literally turned upside down the realization of the idea of the link between science and production.

Table

(1) Число входящих в ВПО	(2) Минэлектротехпром	(4) Минприбор		(7) Минтракторосельхозмаш	(9) Минлегпищемаш
	(3) Союзэлектронтехнология	(5) Союзсистемпром	(6) Союзпромавтоматика	(8) Союзпромавтоматизация	(10) Союзоргтехавтоматизация
НПО (11)	—	2	1	6	—
ПО (12)	—	—	—	—	—
НИИ и КБ (13)	5	19	15	—	8
Предприятий (14)	3	—	4	2	12

Key:

1. Number included in all-union production association
2. Ministry of the Electrical Equipment Industry
3. Soyuzelektrontekhnologiya
4. Ministry of Instrument Making, Automation Equipment and Control Systems
5. Soyuzsistemprom
6. Soyuzpromavtomatika
7. Ministry of Tractor and Agricultural Machine Building
8. Soyuzpromavtomatizatsiya
9. Ministry of Machine Building for Light and the Food Industry
10. Soyuzorgtekhavtomatizatsiya
11. Scientific production associations
12. Production associations
13. Scientific research institutes and design bureaus
14. Enterprises

Another obstacle is related to the activity of branch administrative agencies. The formation of production associations that are optimal in composition (5-10 production units, 10,000-30,000 workers) was supposed to have led to a reduction of the number of central administrative agencies. But in fact the number of ministries, departments and subdivisions within them after the publication of the decree, "On Several Measures for Further Improving the Administration of Industry" of 2 March 1983, not only did not decrease, but even increased. The possibility of losing the attributes of independence was for the higher administrative agencies perhaps the main motive for creating associations of 2-3 and sometimes even 1 production unit, and then there was a

tendency toward reducing their average number.* With this approach the desire of the scientific research institutes and design bureaus to retain their existence independently of production does not have the proper opposition from branch administrative agencies.

The formal bureaucratic approach to improving production administration is undoubtedly one of the reasons for the reduction of the growth rates of public production in recent years. From the organizational standpoint, for the majority of associations that have been created there is a lack of correspondence between practical measures and the nature of the effect of laws of production organization: in small associations the sphere of effect of the law of concentration of production remains practically unchanged (and is even narrowed when enterprises of various profiles are joined together) and the possibilities of division and corresponding specialization are not realized; it turns out to be impossible to achieve a proportional relationship between preparation for production and direct production in these associations; their contradiction grows, but it is not resolved. The scientific production association and the scientific-technical association are also characterized by a disproportionality between services for preparation and direct production, but it has a different polarity: they are organizationally separate from production although the existence of experimental production somewhat lessens the problem. For example, a considerable proportion of the completed developments of the Lenneftekhim scientific production association, with an overall annual economic effectivness of 158 million rubles, "up to the present time remain on the outside, and have not been applied in industry" [18].

The formation of "cut-off" associations can be explained to some degree by the complexity of the reform of the administration of the economy that is being conducted in the economy. But one must keep in mind that the "lack of development and lack of stability of the form make it impossible to take further serious steps in the development of the content, cause disgraceful stagnation and lead to a squandering of forces and a lack of correspondence between word and deed" [2, Vol 8, p 378]. Therefore even today it is crucial to recall the point that "one should adopt truly revolutionary measures and create a stable alliance of science and production" [3].

What could these measures be?

In the first place, in order to unconditionally complete the changeover to the scientific-technical type of production under the 11th Five-Year Plan, all scientific research institutes, design bureaus and other independent organizations in the sphere of preparation for production must be included in production associations, and scientific production associations must be expanded as a result of encompassing enterprises under their jurisdiction. In construction it is necessary to follow the path of forming territorial construction associations with design and technical centers similar to NTTs's, which should

*Thus in the Ministry of Chemical Machine Building in 1981 for 40 production and scientific production associations there were 77 enterprises [17]. According to our calculations, in 1977 for a smaller number of associations (35) there were 98 production units.

concentrate on developing planning estimates for all facilities under construction in a given region in this construction association (except for the technological part of the designs of complicated facilities--metallurgical, petrochemical and other such enterprises). Only in individual cases and as exceptions can there remain--no more than one in a scientific production association or ministry as a whole--independent scientific research institute for carrying out functions in preparing for production that are common to the entire branch or subbranch. Taking into account the fact that the ministries are "interested parties," the development of plans for the creation and development of associations that correspond to the scientific and technical type of production, and control over their implementation should be provided by organizations that are directly under the jurisdiction of the USSR Gosplan and the gosplans of the union republics, and in construction--Gosstroy. Of course the proposed measures should not apply to scientific research institutes and design bureaus of the academies of sciences that are conducting fundamental research and development which is of a general branch significance. Here, in order to provide for priority for expansion of the production of the latest products or the dissemination of progressive technology, it is expedient to permit the formation of "free" enterprises and associations that are not under the jurisdiction of any ministry.

In the first place, the implementation of the proposed measures will contribute to releasing a considerable number of employees, especially engineering and technical personnel, and, consequently, will sharply reduce the need for certified specialists. This will make it possible to use the free material (and personnel) resources for improving the quality of secondary and specialized education, to have stricter selection of the contingent of future students, and to develop the system for increasing qualifications at more rapid rates.

In the third place, a reduction of the overall need for engineering and technical personnel will solve two more problems: 1) as a result of saving on the wage fund from released workers, to increase the average earnings of engineering and technical personnel,* and, finally, to fill those positions which are presently held by "practical workers" with specialists who have diplomas.

Thus one can draw a conclusion: the organizational content of the scientific and technical revolution and its essence consist in changing over from the industrial to the scientific-technical type of production. Analysis of this problem in greater depth requires further research and development.

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*According to data from an economic survey of the newspaper PRAVDA, there are now more than a million people in the country working as handymen, cooks, loaders and waiters even though at one time they received a higher technical education [19].

BIBLIOGRAPHY

1. Marx, K. and Engels, F., "Soch." [Works], 2d ed.

2. Lenin, V. I. "Poln. sobr. soch.," [Complete Collected Works].

3. Brezhnev, L. I. "Rechi i stat'i" [Speeches and Articles], Vol 4, p 218.

4. "Materialy XXV s"yezda KPSS" [Materials of the 25th CPSU Congress], Moscow, Politizdat, 1976, p 173.

5. Volkov, G. "Istoki i gorizonty progressa" [Sources and Horizons of Progress], Moscow, Politizdat, 1976, p 228.

6. EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO).

7. "Narodnoye khozyaystvo SSSR. Statisticheskiy yezhegodnik" [The USSR National Economy. Statistical Annual], Moscow, Statistika.

8. Kushlin, V. I., "Uskoreniye vnedreniya nauchnykh dostizheniy v proizvodstvo" [Acceleration of the Introduction of Scientific Achievements Into Production], Moscow, Ekonomika, pp 39, 42.

9. Kulagin, G. A., "Rabochiy--upravlyayushchiy--uchenyy. Zametki direktora" [Worker--Manager--Scientist. Director's Notes], Moscow, Sovetskaya Rossiya, 1976, p 11.

10. Petrov, A. S., "Osnovy organizatsii upravleniya promyshlennym proizvodstvom" [Fundamentals of Organization of Administration of Industrial Production], Moscow, Ekonomika, 1969, p 131.

11. BSE, ed. 3, Vol 9, p 305.

12. Val't L. O., "The Relationship Between Structure and Elements," VOPROSY FILOSOFII, 1963, No 5.

13. Marx, K., "From the Manuscript Legacy," KOMMUNIST, 1958, No 7.

14. Nazarevskiy, V. A., "Razrabotka i osvoyeniye novoy produktsii v SShA. Praktika korporatsiy" [The Development and Assimilation of New Products in the United States. The Practice of Corporations], Moscow, Nauka, 1977.

15. Alakhberdyan, D. A., Slastenko, Ye. N., "Metodologicheskiyye osnovy formirovaniya ob"yedineniy v promyshlennosti" [Methodological Bases for Forming Associations in Industry], Moscow, Ekonomika, 1974, p 13.

16. "Sovershenstvovaniye khozyaystvennogo mekhznizma. Sb. dokumentov" [Improving the Economic Mechanism. Collection of Documents], Moscow, Pravda, 1980, p 24.

17. PRAVDA, 8 May 1981.

18. Lastovkin, G., Sadchikov, I., "Roads and Lanes," EKONOMICHESKAYA GAZETA, 1982, No 51.

19. Parfenov, V., "Engineers," PRAVDA, 29 June 1981.

11772
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SUCCESSES, SHORTCOMINGS IN USING PRODUCTION WASTES AS RAW MATERIAL

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 5, May 83 pp 40-43

[Article by L. Glushenkova, head specialist of the Belorussian Gosplan Department of Administration of Science and Technology: "Wastes? No, Raw Materials."]

[Text] The economical and rational use of all forms of resources under modern conditions is a task of nationwide significance. Its urgency is caused by factors such as the progressively growing need for raw material, fuel, energy, and supplies, the limited and non-renewable nature of many minerals, and the difficult conditions of mining them and transporting them to where they are needed.

The rapid development of chemistry, petroleum processing and petrochemistry, microbiology, and a number of other branches of industry in our republic has been accompanied by the formation and accumulation of a large quantity of production wastes, which today not only take up a great area on the ground, including agricultural land, but also pollute the atmosphere. Many of them still have no practical use. The wastes from the leather-footwear, textile, timber, and wood-working industries are also a long way from being fully exploited. And yet in the majority of cases, they are very valuable raw materials. The quality of articles made from them is frequently better than those manufactured from traditional materials.

Our republic has launched a number of effective measures to find, inventory, collect, store, and make use of production wastes. Special statistical accounting has been introduced, and a department has been created in the Belorussian Gosplan for the utilization of secondary material resources. Jointly with the Belorussian Gossnab, this department has prepared recommendations for improving the use of production wastes in the national economy. In order to widely publicize advanced experience accumulated in this endeavor, a continuous exhibition has been organized. It presents very interesting displays of industrial articles and consumer goods made from wastes.

Especially noteworthy is the experience accumulated in the construction materials industry. About 80 percent of the broken and scrap glass it

generates is processed and returned to production for manufacturing glass containers, glass plates, and decorative-finishing tiles. Cement production uses about 170,000 tons of granular blast furnace slag and pyrite cinders, and also about 9,000 tons of sulfite-alcohol residue. A cardboard-ruberoid plant in Osipovichi annually processes more than 60,000 tons of scrap paper and textiles, making roofing material from it. In addition, it uses more than 4,000 tons of linen fiber for manufacturing linen-fiber tiles and about 700 tons of synthetic fiber wastes for manufacturing vorsonite napped floor coverings.

In Belbumprom Production Association, waste paper has replaced 60 percent of the cellulose needed to produce paper and cardboard. The Beloruskaliy Production Association is building facilities for shipping industrial salt with a capacity of 2 million tons per year, which will make it possible to reduce the delivery of that product from other republics. A number of local industrial enterprises have assimilated the production of house paints and silicate paints, classroom chalk, and spackling with phosphogypsum and silica gel. From the production wastes of this sector's enterprises, various products are put out which total almost 40 million rubles annually.

The proprietary, economically interested approach to the matter yields an appreciable economic effect. This is shown by just a few examples. The Svetlogorsk Artificial Fiber Plant put into operation an experimental-industrial unit for recovering zinc from cord production wastes, which makes it possible to annually produce about 6,400 tons of zinc oxide (expressed in terms of metallic zinc) and fully satisfy the plant's need for this metal. The economic effect is almost 2 million rubles a year. The Svetlogorsk chemists also decided to construct facilities for recovering carbon disulfide from exhaust emissions by trapping it in reactors with activated carbon for subsequent desorption with water vapor. In this way about 11,000 tons per year, worth more than 2 million rubles, will be returned to production.

The Lida Paint and Varnish Plant is successfully using the burned wastes of caprolactam production--"X-oil." As a result, 171 tons of flax oil were saved in just a year, and the Azot Production Association in Grodno received more than half a million rubles from selling these wastes. Effective use is being made of secondary material resources, raw materials, fuel, and energy in the Polimir Production Association. As a result, consumption norms are decreasing 30 percent each year.

Scientific-research and project-design organizations of the republic are rendering appreciable help to industrial enterprises in resolving the most difficult tasks of developing low-waste and zero-waste technology, and making economical use of raw-materials resources. Thus, for example, using techniques developed by the Belorussian Academy of Sciences Institute of the Mechanics of Metal-Polymer Systems, the Belorussian Ministry of Local Industry's Gomel' Plastic Goods Production Association organized the production of articles made from wood fiberglass using wood wastes, including rollers for conveyor belts. The use of these rollers instead of metal

ones made it possible to save thousands of tons of rolled metal. Also important is the face that each ton of polymer structural materials used instead of metal makes it possible to lower labor costs in machine building by 700-800 man-hours, according to data of the Scientific-Research Institute of Technical-Economic Studies of the USSR Ministry of Chemical Industry [NIITEKhIM].

A number of enterprises of the republic, including the Khimvolokno Production Association in Mogilev, the Gomel'drev Production Association, Gomel' Combine of Nonwoven Materials, and others, have introduced technological processes and equipment for processing wastes of synthetic fibers and composite materials and articles, making it possible to save 1.4 million rubles per year. The Novopolotsknefteorgsintez Association has adopted technology for using the acid sludges which form in the production of sulfonate additives to produce boiler fuel, which has made it possible to produce additional oil worth thousands of rubles (the developer was the Belorussian Technological Institute).

For a long time at the Gomel' Chemical Plant, as well as at other enterprises of the sector, one of the "bottlenecks" was the recovery of phosphogypsum. Last year a shop was put into operation for drying and granulating this secondary product, making it possible to use it in cement production. The Belorussian Polytechnical Institute is now laying the groundwork for constructing a shop to produce blocks, decorative tiles, floor tiles, partitions, and other items, which will make it possible to fully utilize the phosphogypsum. Incidentally, this will help provide the republic's construction industry with new materials and raise the architectural-artistic level of buildings and constructions.

And still only an insignificant portion of millions of tons of wastes are finding use.

The fact is, the adoption of the results of research conducted by scientific-research organizations and VUZes of the republic for creating low-waste and zero-waste production facilities is going on extremely slowly. One of the reasons for this abnormal situation is that the enterprises lack the necessary economic motivation. Many of them regard production wastes as "someone else's" creation. Insufficient allocation of funds and equipment for using wastes also plays a part.

The Slutsk Sugar Refinery's installation of a system to recover lime from filtration residue (a method worked out in the Minsk Scientific-Research Institute of Construction Materials) has been delayed for an indefinite period. The reason--the USSR Ministry of Food Industry has not allocated the necessary capital investment; although adoption of this technology would make it possible to organize practically waste-free sugar production and reduce by 80 percent the importing of lime for these needs from outside the borders of the republic. Another project delayed because of the absence of capital funds is the production of rubberized cord asphalt tiles at the Mogilev Reclamation Plant. Such tiles are widely used for constructing floors in livestock enclosures (their service life is 15-20 years, that of wood floors is not more than 3 years). The use of these tiles would mean significant savings of funds and wood.

The Rechitsa Hydrolytic Yeast Plant annually dumps 170,000 tons of lignin and 116,000 tons of tan waste, which is valuable raw material for furfural production (a wood chemical product, widely used as a selective solvent in petroleum refining, paint and varnish production, and medicinal preparations). The plan for expanding the plant calls for the construction of a shop for producing furfural from tan waste with a capacity of 4,600 tons per year, but the Belorussian Ministry of Industrial Construction is holding up its construction, pleading the lack of construction capabilities in Rechitsa. The Belorussian Academy of Sciences Institute of Physical-Organic Chemistry developed a method for recovering lignin and making ligno-manure composts which are as good as peat-manure ones. It is true that their quality largely depends on the neutralization of the sulfuric acid contained in the lignin, and the uniformity of its mixture with powdered dolomite. So it is worthwhile to organize the neutralization of lignin in specialized production installations. Ligno-manure composts can be of great help in more fully satisfying agriculture's need for organic fertilizers in regions adjoining the Rechitsa Hydrolytic-Yeast Plant and the Bobruysk Hydrolytic Plant. This is particularly important because these regions have a great deal of low-fertility sandy and sandy loam soils, and urgently need organic fertilizers. According to scientists' calculations, the use of lignin for making composts can save the republic's economy at least a million rubles per year. Unfortunately, the solution of this problem is also lagging.

Recently Belorussian Gosplan drafted a new program which calls for the adoption in production of technological processes for rational use of production wastes from the chemical industry, petrochemical industry, microbiological industry, food industry, and other sectors, and also the further development of scientific-research, structural, and technological-design works in this line. Well, what does it call for, specifically?

The Beloruskaliy Production Association plans the construction of an experimental-industrial installation for producing 50,000 tons per year of slow-acting granular fertilizer based on clay-salt sediment and powdered [pylyashchiye] fractions of potassium chloride. Tests of these fertilizers showed their advantageousness in raising sugar beets and feed crops. In 1980-1981, this association constructed and is now assimilating an experimental-industrial installation to produce powder from clay-salt sediment. Tests conducted by the Gomel' division of the Belorussian Scientific-Research Geological Exploration Institute and the Belneftegazrazvedka Combine showed that drilling muds made from this powder can successfully be used for drilling oil and gas wells under difficult conditions, which will make it possible to save about 30,000 rubles on each well. The new program calls for experimental-industrial testing of this powder for preparing construction solutions and plain concrete. If the test results are positive, the volumes of clay-salt sediment used can be significantly increased.

In order to make fuller use of broken glass, the Belorussian Ministry of Local Industry's Domanovskiy Combine of Construction Materials is setting up a facility to produce a new finishing material--glass marble--according to a technology proposed by the Minsk Scientific-Research Institute

of Construction Materials. Bobruyskshina and Belarus'rezinotekhnika production associations are planning to build experimental-industrial installations for processing rubber wastes by the thermodestruction method. This will fully resolve the problem of using rubber wastes, including the currently unusable metallic-cord tires.

At the Zhlobin Artificial Fur Factory, plans are being made to prepare and in 1984 install a production line for heat-insulation tiles made from scraps of artificial fur. In 1985, it is planned to process up to 750 tons of nitron fiber wastes in this manner, since burning them releases poisonous substances into the environment. The Novopolotsknefteorgsintez Production Association plans to build an installation to produce super-peptizing agents from polyethylene production wastes and spent sulfuric acid. The use of super-peptizing agents improves the properties of concrete used in construction, reduces the consumption of cement, lowers labor costs and consumption of energy resources in manufacturing concrete products, and lowers the prime cost of a cubic meter of concrete by 3.2-3.6 rubles.

The food industry has available significant resources of secondary raw material, which in a number of cases are not being used with sufficient effectiveness, or not used at all. The Pinsk and Bobruysk wineries are planning to create divisions for producing fruit powder and apple-pectin paste from apple peelings (the relevant research was done in the Belorussian Academy of Sciences Institute of Heat and Mass Exchange and Mogilev Technological Institute). In 1985 these enterprises plan to produee 420 tons of new semiprocessed items, whose use in producing sweet goods (jelly, zefir, pastila, and others) will save up to 36 rubles for each ton of product.

Fourteen scientific-research organizations and VUZes, and 16 production associations and industrial enterprises are involved in fulfilling the new program. Carrying out what has been planned will promote ecologically closed production systems with comprehensive recycling of raw materials. The economic effect will be more than 7 million rubles, and pollution of the environment will berreduced. Management and control of fulfilling the program is being carried out by a coordinating council which is made up of prominent scientists and highly qualified specialists of enterprises.

At the same time, it cannot be considered normal that many scientific establishments of the Belorussian Academy of Sciences are remaining on the sidelines. Out of five institutes in the Department of Chemical and Geological Sciences, only one will take part in implementing the program.

On the other hand, enterprises too do not always take effective measures to realize the scientific results which are obtained. Of course, in many cases, production wastes cannot be used in their original form. In order to make them into useful raw material, additional processing is required. It is worthwhile to do this processing at the enterprises which generate the wastes. Thus, thanks to the fact that the Gomel' Chemical Plant has organized the drying and granulation of phophogypsum, it will be possible to use it in the construction materials industry. The drying of clay-salt sediment in the Beloruskaliy Production Association is opening

the way for using it in geolgoical exploration. The refining of "X-oils" in the Grodno Azot Production Association has made them widely available for use in the paint and varnish industry.

But this is not happening everywhere. Scientists of the Belorussian Highways Scientific-Research Institute have been working for 10 years on ways to use vat residues (diemthylterephthalate production wastes from the Mogilev Khimvolokno Production Association) for laying pavement. And their results have not been put to use, since the wastes contain a significant quantity of dimethylterephthalate, which can ignite spontaneously and is hazardous for those who work with it. The problem could be solved if the Mogilev chemists would organize the elimination of this substance at their own enterprise. The adoption of this process would make it possible not only to reduce the volume of scarce asphalts used in road construction but also to obtain additional raw materials for producing synthetic fibers. Neither have they received support and techniques from the Belorussian Technological Institute for producing plasticizers made from waste materials for recovering rubber. It seems that the management of the Khimvolokno Association ought to pay more attention and act more responsibly with regard to scientists' suggestions.

By mutual consent of the Minsk Endocrine Preparations Plant and the Minsk Yeast Combine, the Belorussian Academy of Sciences Institute of Experimental Botany, with the participation of the Belorussian Scientific-Research Sanitary-Hygiene Institute, conducted research and determined the possibility of using an ammonium sulfate solution resulting from vitogepate production for producing yeast. The USSR Ministry of Health gave permission for its use. As a result, the Minsk Yeast Combine can decrease the use of standard ammonium sulfate by 300 tons per year, and the endocrine preparations plant can stop 720-750 tons of 40-percent ammonium sulfate solution from running down the drain. Unfortunately, the Minsk Yeast Combine has done nothing for comprehensive testing of the new form of raw materials and using it in production, or getting together the necessary normative-technical documentation.

In order to achieve substantial practical results in using waste materials, it is necessary to unite the efforts of institutes and VUZes with sectorial scientific-research and project-design organizations, production associations, and industrial enterprises.

12255
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USE OF SCIENTIFIC POTENTIAL IN INDUSTRY DISCUSSED

Tashkent EKONOMIKA I ZHIZN' in Russian No 2, Feb 83 pp 32-33

[Article by K. Shakirov, senior scientific associate of scientific-technical progress sector of NIEI (Economics Scientific Research Institute) of Uzbek SSR Gosplan: "How to Improve the Use of Scientific Potential in Industry: Going Hand in Hand"]

[Text] "We have great reserves in the national economy," said CPSU Central Committee General Secretary Yu. V. Andropov at the November CPSU Central Committee Plenum. "These reserves must be sought in the acceleration of scientific-technical progress and in the broad, swift introduction of the achievements of science, technology and foremost experience into production."

The question of effective use of foremost scientific-technical achievements and the latest engineering solutions and management methods in production today acquires particular urgency. Just how is the scientific potential which has built up in the republic being used?

This article will discuss the practical application of results of basic research, which are considered to be concentrated in scientific establishments of the Academy of Sciences, general technical establishments, and sectorial higher educational institutions in the republic. Today they are deservedly viewed as a component part and, moreover, as the leading part of the scientific potential of physical production sectors. These scientific systems have begun to work closely on current national economic and sectorial problems as a result of consistent implementation of the party's course toward an integral combination of science, technology and production. The Experimental Plant Biology Institute and the Physical Technical Institute of the Uzbek SSR AN [Academy of Sciences], the Tashkent Polytechnical Institute and the Tashkent Agricultural Irrigation and Mechanization Institute are working productively in this direction, but the level of use of end results of the scientists' activity still cannot be considered sufficient.

A general analysis of the fulfillment of plans of scientific research projects for the 10th Five-Year Plan shows that an average of some 1,600 developments in the field of industrial production were carried on each year in Uzbekistan. This is almost one-third of the sum total of topics being fulfilled. Meanwhile for that same period the number of developments not introduced to production doubled from among those subject to planned introduction. The fact

that a portion of them was introduced only several years later indicates that many scientific research projects cover a long path to industrial assimilation and practical application.

Here are some data of a specialized study of the status of introduction of applied scientific research projects in the republic. It showed that while proposals of sectorial scientific research institutes and engineering organizations are being realized relatively promptly and corresponding indicators of introduction are on the whole at the level of average union indicators, such a situation has not yet become typical of scientific establishments of the Uzbek SSR AN and higher educational institutions. The time periods for materialization of their developments are 5-7 years, and at times more than ten years. This is apparently why, although the relative proportion of these developments is growing in the overall volume of projects being introduced in industry, it nevertheless remains very low.

For the sake of objectivity it should be noted that much has been done and is being done in the republic to ensure the accelerated materialization of scientific-technical achievements in various sectors of the national economy. Proof of this is the development of diverse forms of cooperation by scientific establishments and industrial enterprises, the transformation of ordinary NII'. [scientific research institutes] into comprehensive ones, the creation of scientific-production associations, including on the basis of an academic institute for the first time in the country, and much more. Nevertheless there still remain many problems here awaiting resolution, since essentially the problem of accelerated introduction of completed scientific research projects is the problem of creating necessary preconditions for economically effective functioning and coordination of links in the elaborate "science-engineering sphere-production" chain.

Attention should be given at the present time to what are from our standpoint two very important points. First of all it is the separation of subject matter of scientific research organizations from current needs of industrial production practice, which still is being observed. The established methods of drawing up the problem-oriented topical plan according to the subjective principle, without thorough coordination with sectors representing the sphere of industrial assimilation and end consumption of scientific results, make themselves known here. The majority of research being done now still is not encompassed by appropriate plans and agreements on scientific-technical cooperation.

Some of the developments recommended for introduction to industry are being delayed by the fact that they are not backed up by necessary documentation attesting to their scientific-technical level, technical-economic substantiation, and readiness for series production. This is why the adoption of a certification of the quality of "scientific product," intended to determine the significance of production assimilation   this product, seems so timely.

Interest is raised in this regard by the system of determining the fundamentality of innovations proposed by Leningrad economic scientists E. Torf and Yu. Sladkov. Fundamentality here is taken to mean the extent to which scientific result is used in obtaining fundamentally new products, articles and

processes, and which provides for a substantial (2-3 times or more) increase in their technical-economic parameters, and particularly in labor productivity. Practical application of this system was tested and demonstrated in the example of the synthetic fibers industry. Based on a classification containing seven points, the authors performed a certification of the production importance of developments of one of the sectorial NII's performed during the period 1976-1980, and determined that there was an overall lack of developments making radical changes in production processes among the scientific research projects introduced in practice, and that a majority of scientific recommendations belonged in the lower classes of fundamentality. It is apparent that such a certification will help deepen the research being conducted, make appropriate corrections to problem-oriented topical plans, and concretize impressions about the greatest bottlenecks of production.

Another reason, determined by the difficulties of the introduction stage, is that the existing system for realizing scientific-technical achievements is oriented primarily on sectorial science. A study of the existing procedure for acceptance and approval of proposed scientific recommendations in eight industrial ministries and departments showed that it stems from a normative document standard for the entire country--"General Statute on Procedure for Acceptance and Evaluation of Completed Scientific-Technical Developments," approved by the USSR Council of Ministers State Committee for Science and Technology on 18 August 1969. But being used along with it are a large number of instructions, methodologies and other documentation representing sectorial or other modifications of the general statute. According to them a development in a majority of cases can be accepted and evaluated only after appropriate tests of the new article or engineering process have been performed and recommendations given for its assimilation. This means that the symbol of completion is considered to be preproduction readiness, which can be achieved only with the availability of the necessary experimental production base. This base is weakest in the system of higher educational institutions and in academic NII's. For this reason much time is lost at the stage of production approval on the official correspondence, agreements and so on inevitable in these cases.

It is apparent that the sectorial system for introducing scientific research projects has to show great flexibility with respect to innovations originating in scientific establishments under the purview of the Uzbek SSR AN and the Uzbek SSR Minvuz [Ministry of Higher Educational Institutions]. Assigning research subunits of republic higher educational institutions to concrete sectors is an important step in this direction. The next step is seen to be assurance of the economic unity of interested departments through a wider organization of sectorial laboratories. According to preliminary data, for example, sectorial subunits of a number of natural-technical NII's of the republic Academy of Sciences can be created at more than ten major enterprises of the USSR Minkhimprom [Ministry of the Chemical Industry], Mingazprom [Ministry of the Gas Industry] and Minlegprom [Ministry of Light Industry] and the Uzbek SSR Ministry of Construction Materials.

Integration of scientific research, planning, design-experimental and production-industrial work is the path which speeds up conversion of science into a direct productive force. Scientists and production workers must take this path hand in hand.

6904
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DESIGNERS VOICE COMPLAINTS, SUGGESTIONS REGARDING THEIR WORK

Moscow PRAVDA in Russian 7 May 83 p 2

[Article by Vasiliy Parfenov: "Designers"]

[Text] We are living in a world of machines, which is being constantly improved. A scientist hands over his discovery, like in a relay race, to a designer. The latter incarnates the idea in drawings, and the world of machines is renewed according to them. The links of this chain must be of equal strength and as brief in time as possible.

Our country has many remarkable scientists and designers. Our plants, as a rule, are much younger compared with many enterprises of other states. And still far from all machines and devices are the best in the world. How do the designers appraise this situation? How do they pursue the line of the 26th CPSU Congress and the November (1982) plenum of the CPSU Central Committee toward decisive acceleration of scientific and technical progress?

The Most Important Is To Be a Professional

The creation of any article--be it a motor vehicle, a color television or or an ordinary clock--must be done by professionals, people of high skill.

What must a contemporary designer-professional be like? Here are the answers to this question by 30 experienced engineers of the Moscow Special Design Bureau of Automatic Lines and Standard Unit Type Machines--one of the best in the country. The PRAVDA questionnaire with five questions on the labor of fighters for technological progress was distributed in all departments of the special design bureau [SKB] by secretary of the party organization.

"Each of us must aim at creating equipment of the future. This is a special profession, not every engineer is up to it" (Yu. Korobitsin).

"Besides aptitude, a designer must possess a developed creative mentality, a "feeling for metal," natural powers of observation, courage and confidence in adopting engineering decisions" (A. Nesterenko).

"A designer's labor is, perhaps, no less creative than of representatives of the so-called creative intelligentsia" (A. Aksenov-Zhuravlev).

"A designer must possess a broad outlook, excellent dimensional imagination, fantasy, a feeling of proportions, the makings of an artist-designer and excellent technical memory" (G. Kazak)...

It is doubtful that anything can be added to these answers. It is true that when designing is done by highly skilled people, the results are exceptional. Here are two examples.

A few years ago I saw the operation of an unusual rolling mill at the Chelyabinskiy Tractor Plant. It does not produce rods but finished... toothed pinions and that is why this mill is referred to as a gear-rolling mill. Prior to its creation, pinions were made on milling machines. It was a long, tedious and wasteful process. Millions of pinions are needed by machine builders yearly. So the professionals of the All-Union Scientific Research, Planning and Design Institute of Metallurgical Machine Building [VNIImetmash], who are supervised by Academician Aleksandr Ivanovich Tselikov, have created a completely new method and this gear-rolling mill for mass production of pinions by the method of plastic deformation of metal. Labor productivity immediately increased tenfold compared with milling. The waste of metal was reduced severalfold and the strength of pinions increased sharply.

The manner of professionals can also be felt in the work of specialists of the Saratovskiy State Bearing Plant No 3 [Tretiy GPZ]. Under the supervision of chief designer A. G. Blazhenov automatic rotor lines for the production of bearing raceways were created here. Two rotor lines operating in pairs produce 30,000 finished raceways, which are so precise and identical that it would be impossible to produce ones like them manually. Moreover, they produce 15-fold more than by the usual method. The raceways were formerly grinded by 80 workers of the sector. The lines are now watched by one adjuster per shift.

The true significance of the new equipment is that it not just simply improves the known labor methods but radically transforms them. As a matter of fact, every designer's work of this kind is a breakthrough to a new, much higher storey of a "building," which may be referred to as "progress of technology."

Such breakthroughs will transform for sure into a norm of designing creativity when we will make more accurate the understanding of what new technology is, if we will classify somewhat differently the created and operating equipment and if professionals will engage in developing equipment.

Not to Achieve, But to Surpass

"All future plans must be accurate, so that the treasury is not brought to ruin for nothing and no damage is caused to the fatherland..." Thus wrote Peter I in one of his ukases.

So that a design of a machine will be "very accurate," it must be new. But not every innovation is new. For example, Volga M-24 differs outwardly from

the old Volga M-21. These machines also have many different units. But both are not much different as regards their purpose, operational characteristics and class. There is no leap to a higher storey of a building here.

The skill of a designer is not in making identical machines from components of different shape, but just the opposite: in creating genuinely new models of equipment from the same or even standard components and units. Here the goals of a designer and, for example, an architect are similar--after all, both ordinary residential houses and exquisite palaces are masterpieces of creativity and are created by an architect from absolutely identical bricks. Let the designers bear this in mind and make better use of the fruits of unification.

Our questionnaire, which was distributed in the special design bureau of automatic lines and standard unit type machines, also contained this question: "What is the main task of a contemporary designer?"

The most often repeated responses were. "The level of created equipment must correspond to world standards." "Life demands creation of technology which does not yield to the best samples in the world"...

But why are the goals so modest? Where is the striving to surpass that which was achieved? The USSR State Committee for Standards [Gosstandard] now awards the state mark of quality to goods that "do not yield to the best samples in the world." Perhaps, the usual concepts should be reviewed and new equipment be classified in some other way? Let the mark of quality be awarded to a sample of equipment which surpasses the best samples in the world in all parameters. Yes, there will be much less of this type of equipment. But it will be really new equipment, which will be able to compete anywhere and bring a good income. You see, in this case we will be able to offer to the world market the most expensive commodity in the world--the brain potential.

The next question on the questionnaire: "What else prevents a designer to work creatively?"

Here the answers were most varied. The most often repeated thought--much time is taken by trifling formalization work. And strange as it may seem, the standards are to blame.

More than 70,000 state, republic and sectorial standards as well as 137,000 technical conditions are in force in the country. Standards are the safeguards of quality and the gauges of technical level of production and its reliability and durability. They must not only keep up with the rate of technological progress but overtake it and be stewards of the new. Therefore, they must be improved and renewed in good time.

But to improve not in the way as Leningrad resident L. Popov writes to PRAVDA: "The routine amendment of the all-union state standard [GOST] 2-104-68 orders that drawing zones be marked instead of A2, B4... the other way around 2A, 4B... What is this innovation for?" the designer asks in indignation. "One can imagine the reaction of chess players if they are instructed to record the progress of the game by writing not E2-E4 but 2E-4E... But we, the engineers, are forced to waste time on useless alterations of drawings, which we turn out in the thousands."

And more responses: "The "race" after the plan and transformation of the design bureau [KB] into a "factory of drawings" hinders thinking. Countless coordinations and collection of signatures are also in the way. A fresh thought: it is not the designer who should adapt himself to the outdated level of production, but it must bring itself up to the increasing demands of creators of new technology."

So that every machine of a designer is genuinely new, it is necessary to have constant changes not only in the equipment manufacturing methods but in the designing process itself. Creators of equipment suggest that automated design systems (SAPRy) be introduced more rapidly in the design bureau's work and that the routine part of a designer's work be turned over more boldly for more accurate fulfillment by an electronic computer [EVM].

Honor According to Labor

Contrary to the divergent opinion, the people of the design bureaus that I had visited during the past 6 months did not demand a supplementary wage fund. They believe: allocated funds should be distributed more rationally. The one who works creatively is to be rendered according to his labor, and the one who is only listed as a designer but is an employee by the nature of his work should receive his due. It is better to have 10 talented designers in a department than 20 nonprofessionals. However, this is being prevented by tight planning of the salary structure for specialists. Perhaps the right should be granted to design bureau supervisors to change a staff schedule within the limits of the wage fund and to set salaries depending on the creative contribution? Otherwise it happens that the more capable designers a department has, the greater is the staff of average workers. It would be useful to introduce a "passport system" of engineering and technical personnel [ITR] in every design bureau and to differentiate engineers according to first, second and third categories. The salaries should also be streamlined accordingly without changing the wage fund.

There is an interesting argument underway regarding theses for scientific degrees. Some designers say: it is a shame that they do not have such good conditions for defending theses for a scientific degree like those established for associates of scientific research institutes. Here is an opinion by N. Dolinina, a designer in Kuybyshev City:

"Every ruble of the wages must be paid for a strictly specific result. The additional payment of R50 per month for a candidate's degree to engineers of plants and design bureaus is bewildering. When a man invents something, he is given a single reward. Everything is clear here. But for some reason R600 a year is paid for life for a scientific degree. Did not the proverb "You don't have to be a scientist, but must be a candidate" originate from here? A scientific degree should be taken into account during appointment and promotion to a position. This would be understood. But the payment for a degree should not be an income for life."

Probably, not everyone will agree with this opinion. However, truth is born in arguments...

The prestige of a designer, which has now somewhat fallen in the eyes of the students, can be raised if moral stimuli are used skillfully. Here is what was said in some of the questionnaires: "A writer and not a printer is praised for a good book. Why do we have it the other way around? It is known that the Moscow Plant imeni Ordzhonikidze--our neighbor and related enterprise--is turning out machines and automatic lines according to our drawings. But for some reason the fact that the authors of these machines and lines are designers of an indepedent special design bureau is being often passed over in silence..."

Nikolay Ivanovich Feofanov, chief of this special design bureau, noted during a discussion of the collected questionnaires in the party bureau:

"A gifted artist is justly awarded the honorary title of Merited Artist of the Republic. A scientist may be awarded the title of Merited Man of Science and Technology. Why shouldn't an honorary title of Merited Designer of the Republic be established?"

"A designer today is an engineer with a capital letter and at the same time... he is a technical secretary, a clerk, a messenger, a worker at vegetable bases and a painter at a construction site. It would be better to make it so that everyone would do his own work."

This problem was raised by one of the specialists. What is one to say here? Once a group of designers of the Plant imeni Vladimir Il'ich Association was sent to unload railway cars. Instead of working manually, they found a broken conveyor nearby and rapidly put it in order. As a result, workers began unloading cars several times faster. And the designers returned to their own work.

This is also important: drawings of new machines must not be allowed to lay around on the shelves for years. M. V. Keldysh, an outstanding scientist and organizer of science, said in one of his addresses: "The leading place in implementing the production process today may be taken not by the country which is the first to make a new scientifid discovery, but by the country which is able to better organize its use in practice." It was stated accurately.

Experience of the Ul'yanovskiy Designers

In many countries, including at the plants in Japan, the United States and the FRG, one can see gigantic numerically controlled milling machines which were made in the USSR at the Ul'yanovskiy Special Purpose Heavy-Duty Machines Plant. Man is dwarfed by the giant. The machine even has an elevator. Man controls the operation of these giants by pressing buttons on a panel, which is located at a distance. The machining of parts of huge steam and gas turbines and nuclear reactors is conducted on the "tables" of the powerful machines. This modern equipment is created according to the drawings of the Ul'yanovskiy Main Special Design Bureau, which is located near the plant.

This design bureau is not only well-known for its production, but also for its new organization of labor and wages of its specialists. A wage system based on the final results was introduced here 3 years ago. Fulfillment of a specific project is assigned to a definite brigade of designers. The number of people in the brigade is strictly calculated on the basis of the project's labor intensive-

ness and labor input norms. The brigade is informed of the wage fund and is given one job authorization. When work progresses well and the project is being fulfilled ahead of schedule, the brigade accumulates a savings on the wage fund. The brigade distributes the savings itself among designers based on the work participation ratio (KTU). In this case it is of interest to the brigade to fulfill the work with the least number of people.

As we can see, the Ul'yanovskiy designers have simultaenously introduced the brigade form of labor organization and the Shchekin method. This is the essnce of the innovation. But what is the result?

During the first 2 years of the experiment, the volume of work has increased by 20 percent. The periods for developing machines were considerably reduced. The economic effect from introducing new technology increased 1.8-fold. The quality of machines improved sharply. They are being purchased from us by 35 countries.

It is known that based on the experience of Ul'yanovskiy designers, a major economic experiment was undertaken by a decision of the government at Leningrad associations and design bureaus. It is hoped that the process of checking the experience of Ul'yanovskiy designers would not stretch over many years and that it would be broadly disseminated throughout the country.

...The creators of new equipment. Their labor gives power and glory to the state. The more correctly we organize the rapid passing of innovations via the design bureau from ideas to the conveyor, the more confidently will our motherland gain more new storeys of the building whose name is Progress.

9817
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SOVIET ECONOMIST DISCUSSES EFFICIENT USE OF SCIENTIFIC POTENTIAL

Moscow PRAVDA in Russian 4 Jul 83 p 7

[Article by Doctor of Economic Sciences G. Lakhtin: "Efficient Use for Scientific Potential: Reference Point in a Sea of Research"]

> [Text] Scientific-technical development can be described as a process in which the revolutionizing transformations of production and its gradual perfection are combined. Each such innovation often represents a jump, the refutation of an old technical principle and accession to the throne of a new one. Then a more or less lengthy period sets in during which the new principle is disseminated, perfected and, finally, becomes obsolete. Thus the radio tube was replaced by the transistor, which in turn gave way to the integrated microcircuit. But the radio tube was improved for a long while before it faded into the class of old technology. It became miniature and with a fast warm-up. Hundreds of people worked on this.

There are relatively few revolutionary improvements, and behind each of them stretches a trail of subsequent improvements: Developments are combined with finishing work. But it is specifically the innovations which "make a revolution" and make a deciding contribution toward scientific-technical progress. They must be given a green light, although of course the importance of "squeezing" everything potentially possible out of the technology should not be minimized.

And so in order to accelerate scientific-technical progress it is necessary to change the relationships between development of something fundamentally new and finishing work on something in existence, and place emphasis on major revolutionizing advances and on the replacement of technical principles which are dominant but which already have outlived themselves with new, more progressive ones.

As applied to industrial science this means overcoming minor matters and creating especially favorable conditions for developments of great importance. But first one must learn to single out faultlessly the most important topics from the overall mass. Difficulty lies in the fact that the existing system of controlling applied science is "indifferent" to the importance of work being performed.

Seemingly any NII [scientific research institute] head will name confidently several planned topics which in his opinion are particularly significant, but formally all topics are "equal." And nothing will change on this order until the concept of importance becomes standard, until the delineation of subject matter under this indicator is legitimatized, and until priority support to major projects becomes the rule.

But is it possible to proceed from intuitive to formalized assessments? Yes, it is. The concept of importance is associated with a ponderable national economic result. We expect more from creation of a new unit or production process than from development of a part or industrial technique. This is the first characteristic. Further we will link importance with breadth of dissemination. An innovation applied at the level of the national economy or a group of sectors is more ponderable than that which can be used only in a single production sector. Then comes the question of how far an innovation advances us in comparison with technology being replaced.

The former is evaluated through the economic effect and the latter through the technical and economic level which shows the correlation of real merits of a developed article or process with the highest achievements of today. Based on these characteristics it is possible to distinguish major developments and inventions rather confidently.

An evaluation is easily given numerical form or several gradations of importance can be established (similar to how product quality now is certified by relating it to one of three categories). Of course other approaches are possible. The important factor is finally to get down to business and to find and test in practice the methods allowing identification of highly significant developments.

Major innovations do not arise in a vacuum. They must be preceded by major ideas--discoveries, important inventions, promising results of basic research. For the time being these sources are not always used to the full extent. An example of this is the discovery of the phenomenon of abnormally low friction and the inventions created on its basis which are being poorly realized although many sectors have an interest in them. On the other hand the lack of major innovations which has appeared is above all a lack of major ideas, which merits very serious attention.

A trend toward taking one's discoveries and ideas to realization by one's own resources is making itself known more and more of late in academic science. Academic institutes are forced to turn with many results not to specialized science, but directly to production. Design bureaus and experimental production units must be set up under these institutes not only to perform studies, but also for developments. But academic science thus resembles to some extent specialized science, and in part they already compete with each other. Will this reduce the role of academic science as the generator of starting ideas?

The number of basic pioneer projects in specialized science is being reduced. An initial check of innovative ideas usually does not require great inputs, but even this often is not used. It would apparently be worthwhile to introduce a check of proposals of initiative worthy of attention into the system by

providing the necessary resources for this. Along with encouraging initiative, the initiators also must be encouraged.

The dominance of minor requests is seen in the field of invention, and orientation above all on the perfection of existing articles and processes predominates. Contributing to this is the "unit" approach where every invention is figured per unit regardless of its ponderability. Such an approach facilitates a growth in quantity, but not effectiveness of invention. We often have occasion to encounter a devaluation of the very term "invention." In my view the definition of this concept is so broad and diffuse that it does not permit a precise differentiation of inventions and rationalization suggestions. This is all because a striving to encompass a large diversity of technical solutions which make changes in production by a single formula has gotten the upper hand. But if we distinguish classes of inventions, i.e., provide separate definitions (what to consider the invention of a method, device or substance), then the wordings will become much more concrete and meaningful. I believe this will help set up a barrier to minor topics. It also seems expedient to set apart inventions of great importance and develop especially privileged conditions for them.

There is much in specialized science that contributes to topical continuity and so does not stimulate the appearance of fundamentally new technical solutions. The basic resource--cadres--is firmly attached to existing directions of work. Of course the specialization of scientific workers is a guarantee of their profound competency in their narrow field, but it is also a barrier blocking the mobile transition to the accomplishment of new tasks. As noted at the June 1983 CPSU Central Committee Plenum, scientific establishments must work more efficiently and flexibly.

The capabilities of science above all are the capabilities of its people. It is for this reason that cadres play such a substantial role in choice of topics. Specialization inclines this choice toward continuity. Nevertheless cadres are not a homogeneous body. It is they or, more accurately, those who are most capable and have the most initiative, who give rise to new things which appear in science, and so a well arranged choice of gifted people also is a condition for the appearance of highly significant topics.

A researcher often can see only what instruments allow him to discern in an object of study. The role of technical outfitting has grown so much that it also influences the choice of topics. And while equipment usually is available for continuing work in traditional directions, the posing of fundamentally new topics often is complicated by a lack of necessary equipment, which also contributes to topical continuity and in the final account to minor topics.

Increasing attention to major topics capable of leading to revolutionizing advances in production and concentrating efforts on implementing them does not at all mean that all else can be ignored. Immoderacy here also would be harmful. Minor topics and the improvement in existing technology connected with them represent an important direction of progress. They produce savings of millions of rubles. A sensible balance in subject matter and in the allocation of forces is necessary.

But if we concentrate the attention of scientific research institutes on major topics, what is to be done with minor topics? Here too there is a solution. They can be placed in a separate class, their real expediency certified, and they can be transferred to the plant sector of science. There are many arguments in favor of such a transfer: Enterprise specialists have a better knowledge of applicable technology and equipment, and production improvement is more in their interests. As a rule sophisticated devices and equipment are not required for improving the technology in operation. For example a considerable number of applied developments in the GDR fall to the lot of combines.

Plant science represents a very powerful and not yet fully used reserve, but here too there are many obstacles. Plant research services often are poorly equipped and frequently are used as "fire brigades." Their workers do not enjoy benefits granted to NII associates. Steps of an organizational and legal order are necessary here.

In other words the principle being proposed is development in the institutes and finishing work at the enterprises. With this distribution, even with a substantial reduction in strength the specialized institutes would be able to focus efforts on topics of high importance capable of revolutionizing production. At the same time this would allow moderating the transition to intensive development of science. An enlargement of the topics of specialized institutes would help free academic science of excessive immersion in applied tasks and focus its efforts in strengthening the theoretical foundation of scientific-technical progress.

The intensification of scientific development is a pressing demand of the times. Science must not build up its contribution through additional resources. On this path an increase in results signifies not only and not so much a growth in quantity of scientific results obtained as a growth in their importance.

6904
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SCIENTISTS DISCUSS INCREASED PRODUCTION WITH FEWER WORKERS

Leningrad LENINGRADSKAYA PRAVDA in Russian 26 May 83 p 2

[Interview with V. A. Semenov, deputy general director for planning and economics of the Scientific Production Association of the Central Scientific Research and Planning and Design Boiler and Turbine Institute imeni I. I. Polzunov [TsKTI], by A. L. Merson, senior scientific associate of the Social Economic Problems Institute of the USSR Academy of Sciences and candidate of economic sciences: "Reserves of a Leader"; date and place not specified]

[Text] Our newspaper has described the initiative of scientists of the Scientific Production Association of the Central Scientific Research and Planning and Design Boiler and Turbine Institute imeni I. I. Polzunov on fulfilling five-year plan tasks with fewer workers.

Today, however, it is also important of how efficiently the idea of this important initiative "works" and what hinders its creative introduction in other collectives. It is precisely with this aim that on the initiative of the CPSU obkom's Council of Economic and Social Development research was conducted in a number of Leningrad's scientific organizations, including at the Scientific Production Association [NPO] of the Central Scientific Research and Planning and Design Boiler and Turbine Institute imeni I. I. Polzunov. After the group from the sector of methodology of planning and organization of applied research of the Social Economic Problems Institute of the USSR Academy of Sciences had completed this research, A. L. Merson, senior scientific associate of the institute and candidate of economic sciences, met with V. A. Semenov, deputy general director for planning and economics of the Scientific Production Association of the Central Scientific Research and Planning and Design Boiler and Turbine Institute imeni I. I. Polzunov. They had the following dialogue:

[Question] Valentin Aleksandrovich, our group realizes that the research conducted in your association will not discover "Americas" for you. But I presume that the view, so to speak, from the side will be useful. Thus, ensuring a rapid increase of labor productivity compared with increasing

the volume of production is one of the main tasks in developing our economy. In this connection raising the labor efficiency of scientists simultaenously with reducing personnel at scientific research institutes [NII] and design bureaus [KB] is of especially important significance.

It must be recognized that you association has made good preparations for consistent solution of this task. We have satisfied ourselves that you have used for this purpose such powerful reserves as reorganization of the management structure, adjustment of the economic mechanism and so forth. Unfortunately, many scientific and research institutes have taken a much easier way out by mechanically "apportioning" the task on reducing personnel among all departments and laboratories. A certain raising of labor intensiveness is achieved by such an approach, but the extent of losses connected with poor organization of labor and fulfillment of worthless work which does not correspond to the skill of associates remains unchanged. This is why it would be useful if in our conversation we could illuminate those facets of your association's experience which could be practically and, of course, creatively adopted by other scientific organizations.

V. Semenov: During the 11th Five-Year Plan, we intend to increase the volume of scientific research and experimental design work by 20 percent and at the same time reduce our personnel by 5 percent. I emphasize that the question is about increasing the physical volume of work without taking into account the raising of their estimated cost connected, as a rule, with fulfillment of more expensive orders of the sector. Everything is progressing well so far. Over a 2-year period, our volume of work has increased by near R2 million and our scientific and technical personnel was reduced by 112 people.

You said that we were well prepared for this work. I believe that this happened because we began with such an important matter as the establishment of a normative base for managing research. It is precisely the normative base which makes it possible to calculate how much time and funds should be spent for one or another work. The stage of intensity and efficiency of scientific and engineering work is based on it. How can a policy of intensification be built if there is no criterion for appraising work? This is why we began, first of all, by creating norms for labor intensiveness, estimated cost and work fulfillment period.

We had considerable difficulties here, and here is why. We have a large mix of products being developed: from hydraulic turbines and equipment for nuclear electric power stations to heating units. We had to create norms for every subdivision and every specialized laboratory. We have confirmed them as temporary ones for the present and will work on them later with consideration of the accumulated experience. It is these norms that are in the basis of the planning and organizational work, the most important in which is the responsibiliy of each for assigned work.

[Question] Indeed, based on the results of our research more than 90 percent of your association's associates have a clearly defined independent work sector and 85 percent have official instructions. I must admit that this is more than at other scientific and research institutes, although you also still have reserves.

V. Semenov: Anna L'vovna, but would not strict regulation hinder the creative process? We are not dealing with a worker's output norm, but with research work...

[Question] The results of research (and not of our alone), statistics and, finally, experience, testify that associates whose standard, recurring work is regulated, are using their time more rationally and therefore have more time to look for new solutions, for creativity. Regulation of "regular," as the cosmonauts say, situations, means that an associate is made responsible for fulfilling standard operations by using a scientifically proven and therefore most economical method.

V. Semenov: Perhaps so, although a problem cannot be solved by regulation alone. There is still another reserve, such as mechanization and automation of engineering work and the labor of scientists. A few years ago we have taken a precise course aimed at creating modern test stands and modular sets without which many studies are impossible. We are producing such sets at our experimental plant which was recently modernized. On some experimental sets we have created automated systems for processing test results. Mechanization of the most labor-consuming work is also very important, work such selecting information, computing, multiplying and copying information. Such mechanization does not require large expenditures.

[Question] Quite right, but its prerequisite is centralization of corresponding work. In your association, however, according to our information, nearly one half (46 percent) of associates engage in information search themselves as yet and almost as many are independently conducting calculations without using the services of a computer center.

V. Semenov: I believe that a considerable raising of the associates' labor intensiveness may be expected after complete transition to collective, i.e. to the brigade form of labor organization. May I remind you that we now have several types of brigades in operation. The most prevalent among them is the complex brigade, which includes associates of the Scientific Production Association and designers of our sector's plants. The draft project is developed at the Scientific Production Association, the engineering project together with a plant and the manufacturing plan by a plant itself.

The second form are the consolidated brigades for testing leading models of equipment at electric power stations. Such a brigade consists of 120-150 specialists of various profile, and for the period of tests temporary party groups are organized in it.

However, the principles of coast accounting are implemented most consistently in our brigades of a third type. This applies to brigades-laboratories--permanent subdivisions operating on the basis of confirmed norms, a brigade council is elected in them. When a brigade fulfills its planned work ahead of schedule and reduces labor intensiveness it can accept additional orders and then 30 percent in savings of the wage fund will be paid to brigade members from the material incentive fund. If for the association as a whole the volume of work per associate increased by 9 percent in 1982, then in the five brigades-laboratories it was considerably higher.

[Question] For all that, Valentin Aleksandrovich, how did the reduction of associates specifically affect the technical level and efficiency of developments? For it is known that in science it is not the minimum of expenditures but the maximum effect that is important.

V. Semenov: We fulfilled last year's plan by 106 percent. The economic effect from introducing developments totaled R 63 million. Behind this amount, aside from everything else, is the economy of real resources. In 1982 alone by introducing our developments some 420,000 tons of conventional fuel and nearly [illegible],000 tons of metal were saved. Moreover, we are not delaying introduction of developments: 75 percent of them are being introduced during the first 2 years. Last year, 32 models of equipment created together with plants were awarded the state mark of quality. In short, the effect compared with the years when we had more people working for us has considerably increased. But I must admit that it is becoming more difficult to achieve it, since the equipment for electric power stations that we are developing is becoming constantly complicated.

[Question] In returning to the brigade form of work, toward which many scientific research institutes are now orientated, I would like to say the following. It is very important to make so that brigades would become such primary labor collectives which participate themselves in developing plans and selecting the best methods of research and development. Such a collective must be formed on a voluntary basis, and its supervisor should be selected with the consideration of the collective's opinion. After all, the gist of the matter is that so that a brigade would assume many labor management functions, which are now being fulfilled by the administration. The new law on the rights of labor collectives, whose draft is being currently discussed, creates all possibilities for this.

V. Semenov: It is precisely because of this that we have considerably "contracted" our administrative subdivisions. I will say more: the size of our management personnel in relation to the number of workers is 2.5-fold lower than on the average in the sector.

[Question] The reduction of management personnel, like, incidentally, improvement of the entire organizational structure is not an end in itself, but is directed so that the efficiency of a collective's work is raised. And according to our research, you still have serious reserves here. According to our data, three-fourth of your association's associates could use their professional knowledge and skills with greater return. Here is what the distribution looks like: working in your collective are specialists-"creators" (there are 17 percent of them), whose departure would be a serious blow for the Scientific Production Association, and there are 61 percent of associates who can perform their work in a professional manner. But 19 percent could be replaced with better specialists. As regards the remaining 3 percent of associates, their work efficiency is so low that their departure would be a benefit to work.

V. Semenov: We are, of course, aware of such distribution. But figures are figures for they are specific. At present, when we are developing a comprehensive quality control system, the quantitative appraisals of important aspects of our activity are simply necessary for us. And in this connection, the conducted research is very timely.

As regards the listed figures, although they probably cannot lay claim to absolute accuracy, actually say that we still have serious reserves for improving our work. First of all, I have the reserves of creative growth of our specialists in mind. It is our task, therefore, is to find ways which will make it possible to raise the skill of some specialists to the level of real masters of their work. I believe that the main direction in solving this task must be further work of our party, trade union and Komsomol organizations in instilling personal responsibility for assigned work in every member of the collective. We are now engaged in organizing this important work and are striving to find the most effective forms for its implementation.

9817
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SCIENTIST DISCUSSES PROBLEMS IN INTRODUCING NEW TECHNOLOGY

Moscow SOVETKSKAYA ROSSIYA in Russian 27 May 83 p 2

[Article by G. Popov, doctor of economic sciences and professor of the Moscow State University [MGU] imeni M. V. Lomonosov: "The Expected Effect"]

[Text] It has somehow happened that in the main representatives of science are participating in the discussion of the problems of introduction , which is being conducted by the newspaper. A somewhat lopsided picture has developed: everything depends on production, which introduces innovations poorly. Production is the main thing and I would like to talk about it. But, I think, if we would listen to the plants and sectorial organs, then our idea of the problem of introduction would change somewhat. The introduction stage appears to be the most weak link because it is precisely introduction or a proving ground where the imperfection of the entire mechanism controlling scientific and technical progress is graphically demonstrated.

This, by the way, is evident from the materials published in the newspaper. Thus, Academician V. Koptyug writes about a serious problem--the reduction of budget financing of academic science. But this will unavoidably lead to the shallowing of the river of innovations which flows to production. Academician M. Shilo notes that difficulties with introduction give rise to a desire among scientists to withdraw into the sphere of "pure" science. And this "withdrawal" turns out production which sometimes rules out the very possibility of its introduction. If one would poll practical workers, then it will turn out that not only ambitious vanities but bitter necessity as well force the scientific research institutes [NII] and manufacturing plants into "presenting in a new form" the innovations which were created without the slightest idea of the conditions and possibilities of production.

This is the reason why I believe that the problem of introduction cannot be considered separately. It is an important link, but only a link of the entire "science-production-consumption" chain. If the situation with introduction is poor, then all links of the system are unavoidably distorted; there appears a "pure" science, research for the sake of defending a thesis and so forth. And these changes in their turn worsen the situation with introduction even more.

In reading an interview with Academician A. Tselikov, I started copying the extracts on unsolved problems: a plan in weight terms, not conducive to

introduction of material-economizing structures; a long-term cumbersome procedure in "completing formalities" through plan for devices which will be needed for a new machine; and so forth. The number of extracts increased as I read other publications. In the end there was an awareness that it is necessary not to improve the existing system with the help of hundreds of measures but to create such a control mechanism in which new solutions would not look like props and makeweights but would organically form its very substance. I do not know if readers will agree with me, but this, in my opinion, is one of the important conclusions which suggests itself during attentive study of the problems on introduction.

Here, for example, Academician V. Zuyev notes quite correctly in a talk that today its not as much as the center (Gosplan, the State Committee for Science and Technology [GKNT]) as the sectorial ministries which form the plan of new technology. The share of central organs is reduced to the role of "brokers" of the proposals made by ministries. V. Zuyev suggests strengthening the role of the Gosplan and the State Committee for Science and Technology so that then, as he writes, "the sectors will not dictate their conditions to the Gosplan but will become executors of its will."

Let us look at this closely. What is behind the position of enterprises and ministries? This is well described by Academician N. Shilo in his article when he conveys the course of reasoning by a director who is reluctant to introduce an innovation: the conveyor will have to be stopped, the plan will tumble, the suppliers will have to be changed and wages will be threatened, to say nothing about bonuses. Everything is real here. The established system of management forms a director's interest and dictates the logic of his actions. A supervisor who would act not according to this logic is doomed. I will not go into details, but will say that in ministries as well it is precisely the interests araising from the established system that often predetermine the attitude toward introducing innovations.

What interest will force workers of the Gosplan or that State Committee for Science and Technology to struggle against such a position of subordinate links? What will ensure the required degree of tenacity in defending innovations which are of national economic importance among those who will gain the right of "nondepartmental appraisal" of which Academician V. Koptyug writes about? The threat of losing wages or a bonus? The prospect of frustrating the plan? Removal from a position? Not at all. More often than not, one has to count on today only on the positions regarding these organs and personal feeling of duty. This is a powerful lever but in collision with real interests of subordinate links it becomes invariably weaker.

Today, the central organs and their workers are not financially liable for their actions just as they do not gain materially when assisting in improving the situation. An impression is formed that scientific and technical progress and that which is bears is perceived by them as something hypothetical. It is not accidental that they are quite satisfied with "the expected effect." And they must struggle against the resistance of workers, for whom one or another solution bears real material (and not expected) results. K. Marx and F. Engels wrote well about such situations: the idea invariably covered itself with shame as soon as it detached itself from "interest."

It is appropriate to remind of V. I. Lenin's approach to the work of central economic organs: "All people's commissariats in addition to the Moscow and Petrograd soviets pledge to submit within a one week's period a draft resolution on converting employees (all who are connected with the economy) to the bonus from turnover and from profit, with strict penalties for unprofitableness..."

I think that the matter should be organized in such a manner so that all instructions from above would "tie in" with economically tangible advantage for the executors. In its turn, the greater the effect received by the executors, the greater will be the amount of funds deducted by them to the funds of central organs. Workers of central organs are paid, as demanded by V. I. Lenin, in a share to the achieved effect based on their instructions.

Under such a system something that holds out a drop in profits for the executors will not be imposed on them from above. Under such a system it will not be necessary to "dictate" at all: executors will literally hunt for assignments from the Center as being the most profitable ones. But why would the central organs be the ones which would ensure such advantage? It is precisely because they are central ones and are in a position to do that which is either beyond the strength of subordinate links or takes them too long to do. In short, I believe that they should not push through thousands of individual elaborations but create a situation under which all organs are doing everything possible to accelerate scientific and technical progress, and the Center is supervising only the most important sectors and watches over the problems as a whole.

And, finally, one of the important conditions of the system called upon to stimulate the development of innovations--full cost accounting of the basic economic link, i.e. of enterprises. The cost accounting, I think, should be such that there will be no need to hammer in, to introduce anything new. The basic link should not only absorb but eagerly seek it at central organs, at ministries, at scientific and research institutes and design bureau [KB], in newspapers and journals and at other organizations.

Only in this case will the central organs be able to be automatically freed from the necessity of compelling from above to use or produce new equipment and master long-term technology. Only with full cost accounting of the basic economic link will the organs of centralized supervision be able to change to economic methods of influence for there will be an exceptionally keen reacting object to these methods and there will no longer be any need for administrative pressure.

What is our idea of full cost accounting? If one is to draw the most simplest analogy, then I would refer to it as the brigade contract for an enterprise. Take a job, coordinate the price with the client. The share for wages in this price is known. The difference between expenditures and the price is determined by the profit. The fewer workers used, the higher are their wages. Their higher work efficiency, means higher profit. From profits we make payments to the state for the funds received from it, pay dues to the budget. The balance of profits is used for bonuses, expansion of production.

Wait a minute, any economically knowledgeable person may exclaim. All of this exists now in the present cost accounting! Unfortunately, it only exists in

in form and not in substance. First, a plant does not contract for a job. It cannot refuse. This is not a job but an order. Second, the price of a job is not coordinated, it is established from above. This is not a job. Third, the wage fund is determined not as a share but on the basis of the number of workers. Fourth, profit does not remain in the hands of an enterprise after all payments are made. On the contrary, payments are made to an enterprise itself from the profit and the balance is withdrawn. Fifth, the amount of such payment to an enterprise from profit depends on the percent of plan fulfillment.

The entire essence of the present version of cost accounting, I believe, is contained in this percent. The percent of plan fulfillment does not say what I have done but how I fulfilled the "imposed" task. I can obtain 30 q of grain per hectare and be regarded as poor (if the plan was for 31 q). A neighbor can produce 20 q and be regarded as a hero (if his plan was for 19 q). Some may say: But may it not be possible that the neighbor has such type of land? It is quite possible. But the possibility cannot be ruled out that the neighbor was able to convince someone in something and in some way in order to get a lower plan. But most importantly, my 30 q are always more appreciable for the national economy than the neighbor's 20 q. And so long as the one who had obtained 20 q can be better than the one who had obtained 30 q, a farm cannot have a real orientation toward the criterion of effectiveness.

Imagine that high jumpers are appraised not for the height of their jump but for the percent in fulfilling assignments given by their trainer. Meanwhile, it is precisely the height that is necessary for success at an Olympiad. And the one who was the best a year ago, but had not added anything to his achievement, and possibily had even worsened his results, will remain the best until someone surpasses him.

I am using the sports system as an example because it has something that the present economic mechanism lacks. It has appraisal of objective effectiveness of the end result.

We have attempted to form a system of full cost accounting in the course of economic reform. Levers of effectiveness were introduced. But because economic indexes in the final analysis were linked to percentage in fulfilling a plan, they were unavoidably reduced to **the role of new formalization of an old** task.

In speaking of full cost accounting of an enterprise, it is appropriate to mention V. I. Lenin's thoughts: "...success in its turn undoubtedly demands, in Russia's contemporary situation, the concentration of all authority in the hands of plant administrations. These administrations, formed according to the general rule on the basis of individuality, must be independently in charge of setting the amount of wages as well as of distributing currency notes, rations, working clothes and all other supplies, with maximum freedom of maneuvering, strictest checking of actual successes in raising production, loss-free operation and its profitability and serious selection of the most outstanding and skilled administrators." Here the question is about maximum freedom of maneuvering, while the role of the Center is in controlling profits and loss-free operation.

The existing management system was established in the main during the thirties to solve a general task: to build, relying on the power won by the workers, a technical base and foundations of socialist economy. Under conditions when the socialist power, in the words of V. I. Lenin, did not have a technical and economic base conforming to socialism, the only possible system of economic management was precisely a system of daily centralized control of all parameters of everyday management with the aid of primarily administrative methods. The creation of such management is our historic merit.

But it is precisely the successful results of functioning of this management, which ensured the entry into a period of developed socialism, that have prepared all conditions for rejecting this system and for converting to a new system which conforms to the already functioning economy of developed socialism and relies, first of all, not on administrative methods but on laws of this economy.

In the article "The Teaching of Karl Marx and Some Questions of Socialist Construction in the USSR," Yu. V. Andropov convincingly revealed the essence of today's problem: "The task of thinking over and of consistently implementing measures which are capable of giving great scope to action of the colossal creative forces that are inherent in our economy is regarded as of paramount importance today. These measures must be thoroughly prepared and be realistic, and this means that in developing them it is necessary to unswervingly proceed from the laws on developing the economic system of socialism. The objective nature of these laws demands getting rid of all kinds of attempts to manage economy with methods which are alien to its nature."

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ACCELERATION OF S&T PROGRESS DISCUSSED

Moscow SOVETSKAYA ROSSIYA in Russian 18 May 83 p 2

[Interview with Nikolay Vasil'yevich Lemayev, head of Nizhnekamskneftekhim Production Association, Tatar ASSR, by SOVETSKAYA ROSSIYA correspondent M. Zaripov: "N. V. Lemayev, Head of Nizhnekamskneftekhim Production Association, Reflects on Problems of Accelerating S&T Progress: Integral Sign"; date of interview not given]

> [Text] The Order of Lenin Nizhnekamskneftekhim Production Association is a young enterprise, with the first products obtained here some 15 years ago. During these years, however, the enterprise has become equal with industrial giants and has become a test area for carrying out bold engineering solutions.

[Question] Nikolay Vasil'yevich, pledges of the Nizhnekamsk petroleum chemists for the third year of the 11th Five-Year Plan contain the following phrase: "Develop and adopt 30 inventions." Any invention is the product of inspiration and talent, and realization of concepts at times depends on luck and the confluence of circumstances. Isn't this too "risky" a promise that the plant collective is giving?

[Answer] I believe that this is in the order of things. By the way, we have a special plant introduction service which has the task of development, basic research and the realization of discoveries. It is headed by Doctor of Sciences, Professor Aleksandr Grigor'yevich Liakumovich, of the Kazan Chemical Technology Institute.

During the last five-year plan we introduced 86 inventions in our plants and obtained some 41 million rubles of effect, so that the flight of fantasy and inspiration, like any other work, is subject to planning and control. It is impossible to carry on modern production without this.

But the motives prompting engineers and workers to creativeness is a special subject of conversation. Isn't it really important to realize that you are privy to the latest achievements of technology and science? Not only privy, but you are among the first, leading the others behind you? I am convinced that the chief motivations of invention are not material, but moral gains and an inner need to stand out by what you do and of which others are incapable.

[Question] Now here is what I would like to discuss. Profit is the yardstick of physical production. In other words, profit from product sales must exceed production inputs as much as possible, including those inputs which were made to scientific research. How can production activity contribute to the rapid adoption of discoveries and an increase in the effectiveness of social labor?

[Answer] Above all through the most rapid use of discoveries, without delays and procrastination. In practice it often happens that production workers fear risk and rely on neighbors who will point the way. So it goes year after year.

Back in 1966, for example, Yaroslavl scientists developed a new methodology of a process based on acetronitrile. The chemical reaction began to proceed more effectively than before with an acetone solvent. The new process is universal and not tied to geography, but no one ventured to adopt it for a long while. The development has awaited its time for eight years.

We took an interest in the idea when we began operating a divinyl plant. We decided that it was worthwhile to take a risk. We made corrections and revisions to the plan and cleared the delivery of acetronitrile. I will note that this was enormously more difficult than any engineering and technical difficulties, although the necessary solvent very simply was disposed of by burning at many of the country's enterprises as a by-product. At the plant we designed four production units and got by only with two, and obtained 2.5 million rubles in savings. Many began to work with the acetronitrile after us but you can't drop a word out of a song, as they say: Ten years went by from the researchers' retort to the production reactor, although there was a year of troubles or, pushing it, two years.

Now a word about the following problem, concerning a concentration of production. Today of course one enterprise has a greater capacity than a hundred previous enterprises. It is easier and faster to build small units and there will be practically no gaps between the retort and the reactor, but large-capacity hardware has its advantages--low operating inputs and high labor efficiency. And by-products can be used which are unprofitable to develop in small lots. Even though large plants require long time periods for construction, the most sophisticated production lags behind progress at the moment of start-up for as many years as construction went on, but there will be no return to small "scraps." There is one solution: to follow science and promptly introduce necessary corrections at the stage of the design, construction, installation and start-up. This is difficult and requires additional personnel and resources, but there is no other way.

[Question] Nikolay Vasil'yevich, what are the immediate tasks which must be resolved so that practical work proceeds on a level with the achievements of science?

[Answer] Above all there must be an improvement in the planning of scientific-technical progress, which must assume sufficient foresight, efficiency of thought and the right to independence.

Take a look at the development of domestic economics. KamAZ [Kama Motor Vehicle Plant], small industries of Tatariya and Siberia, and the Nizhnekamsk and Tobolsk petrochemical complexes--these are industrial giants which do not exist in world practice. They demand different forms and techniques of control and planning than in previous years. The heads of such industrial centers must be responsible for their actions and of course have factual rights to take the necessary steps.

[Question] Are you insisting on special privileges for directors?

[Answer] Not privileges but--and this is especially important now--further improvement in forms of production management. The giant enterprises decide domestic economy and its capacity because only concentration produces the highest efficiency of social labor. I already spoke about this. And so the Nizhenekamsk Petrochemical Complex, which last fall celebrated the 15th anniversary of its first products, provides the country with a significant proportion of isoprene and butyl rubbers, a fourth of the styrene, and 15 percent of ethylene. This year our association will manufacture products worth one billion rubles. In time the production will double and each day the enterprise will produce a million in profits.

But for concentration on such a large scale there is a special need for management of people and production. The head of the enterprise, whom the state has entrusted with such a major, responsible matter, not only must have a sum of duties, but also must possess sufficient freedom so as not to ask permission on every occasion: "May I?"

[Question] Isn't it that way now? Aren't the reins of control, approval of projects and construction of plants in your hands?

[Answer] Without delving into detail it is in principle. As a matter of fact it is a bit different. Everything revolves around this "bit." What rights rest with a general director who heads an enterprise with a billion-[ruble] turnover in the field of cooperation with science or, concretely, in introducing discoveries and inventions to production? His entire will is within the limits of 500,000 rubles and with these funds he must order the project, buy the equipment and build something. That is how it was 15 years ago when one plant was in operation in the combine, and nothing has changed now when the output of some 20 plants is worth a billion, and no change is seen tomorrow, when turnover will double. With today's demands the amount of a half-million no longer suits anyone.

We have a strong experimental base with 12 candidates of sciences in the plant laboratory, and there are not as many specialists of that qualification in another specialized institute. Then when some kind of idea arises which we are capable of executing without going beyond the association's gates, I have to knock at the door of the ministry, Gosstroy, Gosbank and Gosplan. I have to obtain numerous permits and waste a great deal of time.

I will tell you a specific story. True, it is still hard to say how it will end, in disappointment or success, but everything in due course.

There is an enterprise, an ethylene complex, on the Nizhnyaya Kama. It was built figuring on major consumers and for the first time in domestic and world practice it was linked directly with Kazan, Ufa and Sterlitamak with the help of underground conduits. This is fine, but on the other hand the load on the hardware depends not only on us, but also on how successfully the partners function. If a small interruption occurs at the other end we have to burn up the products.

The complex has been in operation since 1976, and capacities are about 60-70 percent used.

In short we began to figure how to send the torch through the reactor, for ethylene is a universal raw material and practically any product can be obtained from it. We came up with something. We decided to obtain divinyl, which will go into rubbers directly at our site. We began to look for a catalyst which would help the instrument control men work a small miracle by converting ethylene to divinyl. We tried many variants and then our permanent partners from the Yaroslavl Monomer Institute suggested a process developed together with an associate of one of the Leningrad academic institutes back in 1977. We were trying for such a long while, and all without result, but the scientists had put their work on the shelf and, instead of beating the drum and advancing the work they wait for someone to bother them. We arranged a test of the development and 250 hours of laboratory tests under the most extreme conditions showed that this was the very thing needed!

[Question] Then the story still is approaching a happy conclusion?

[Answer] This is only the beginning, the first link of a long, lengthy chain. Let's have a look at what must be done for the process to get going and the enterprise to receive additional products. About 15 pieces of hardware of all kinds must be installed in place of the torch line. The work is not much and is a trifle for our capabilities, but how much time will go for observance of formalities? A planning assignment must be issued: Three months will go by even if the planning institute takes up the matter on a priority basis. Gosplan, and nothing lower, must "have a look" at the plan and the okay will be given there after consultations with experts, refinement and corrections. The next task is to defend it in interdepartmental commissions, obtain permits from supervisory levels, get into the title list of builders and order equipment, and this is done once a year like at a fur auction, but with the difference that there is no procrastination with furs while enterprise requests are received with a reserve of a year or two. We began working on the ethylene torch last year and will complete the operation in about 6-7 years. More time will be spent on coordination than on construction.

[Question] But as experience shows, each additional check and extra consultation of experts helps avoid mistakes and achieve accuracy.

[Answer] Of course, there unquestionably are some kind of advantages in such a multirung ladder of coordination. No mistakes will remain in the work after such a control mill, but by this time the need for such a discovery also will disappear because it will become obsolete, new developments already will be appearing and everything will have to be done anew.

[Question] What do you suggest?

[Answer] The simplest and most accessible is to simplify paperwork and free such levels as Gosplan, Gosstroy, Gossnab, the ministries and other state agencies of the petty supervisory-inspection red tape. Let them work on major strategic tasks and the production workers will cope with current problems. The heads of such national economic subunits as KAMAZ, Siberia's small industries, the Nizhnekamsk Petrochemical Complex and other giant enterprises must have freedom of maneuver. Speaking of a ceiling, it must be not 100,000 rubles, but at least 10 or 20 times higher. In this case it will be possible to speak of rapid realization of major concepts. Enterprises will attract subcontractors, order equipment, build and start up installations and, in short, hold in their hands the reins of control over a large business machine.

We figured how much time would be required for the ethylene problem if we got by "without bringing in" higher echelons, so that everything is resolved at the level of the customer, i.e., the enterprise, and it turned out to be twice as fast!

The science information service--state, sectorial and regional- is poorly arranged. With today's chemical boom 625 special journals are published, approximately 1,000 books are printed in a year, a thousand dissertations are written and some 70,000 scientific articles are printed in the world just in our area. How can the practical engineer, who is up to his ears in current production concerns, find his way in this thicket of specialized knowledge and find something necessary and useful? This is more misfortune than fault. Another part of the problem is the low activity of science in advancing developments.

We have many partners among whom are such strong collectives as the Kazan State University, Moscow Chemical Technology Institute, the Azerbaijan SSR Academy of Sciences Petrochemical Processing Institute and the Voronezh and Tbilisi polytechnical institutes. Relationships form in such a way that the scientists are like affiliates in representing firms of good services, the residents of which await the receipt of orders. They respond willingly to some suggestions by production workers and concerning others they ponder: "Accept or not accept?" And there are enough orders. Those who execute them are excited by such serious and interesting problems as the utilization of wastes, reduction of energy consumption, and possibilities of a more productive loading of reactors and better extraction of the end product from raw materials. There are 100-percent, pressing guarantees for introduction, but there are fewer counterproposals than needed.

The simplest and most accessible is to scold science, but it is better to try to understand why scientific subunits work with great willingness on progress in general but respond with lesser zeal to the requirements of a concrete production and do not try to push their discoveries through. It is worthwhile thinking what has to be done for science to count not only on a return of inputs, but have the right to its share of profits from the realized discoveries. In calling on science to cooperate the production workers must assume responsibility for the rapid realization of discoveries acquired by knowledge, and science is obligated to strive with greater zeal and diligence to introduce its achievements. There must be no place here for self-accounting, boasting, or a list of topics fulfilled, books written and dissertations defended: the yardstick for evaluation must be only the work completed.

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ACADEMICIAN OUTLINES ACCOMPLISHMENTS, NEW DEVELOPMENTS IN OPTICAL PHYSICS

Minsk KOMMUNIST BELORUSSII in Russian No 4, Apr 83 pp 66-72

[Interview with Boris Ivanovich Stepanov, director of the Physics Institute of the BSSR Academy of Sciences, by KOMMUNIST BELORUSII correspondent: "A Scientist's Duty Is To Serve the Motherland"; date and place not specified]

[Text] Our new column opens with an interview by this journal's correspondent with the director of the Physics Institute of the BSSR Academy of Sciences, Boris Ivanovich Stepanov.

B. I. Stepanov was born on 28 April 1913. After completing grade school and a factory-plant school, he enrolled in 1930 at the Physics Department of Leningrad State University, and while still an undergraduate student, began to work as a senior laboratory assistant at the State Optical Institute, where he subsequently did graduate work. In 1939 B. I. Stepanov joined the ranks of the CPSU, and in that same year defended his candidate's dissertation. In 1941 he went to the front as a volunteer, fought in one of the partisan detachments of Leningrad Oblast, and he also fought near Stalingrad.

In 1943 B. I. Stepanov was called back into scientific work. In 1948 he became a doctor of physical-mathematical sciences, in 1953 he was elected to be an academician of the BSSR Academy of Sciences, and in 1957 he was made director of the Physics Institute of the BSSR Academy of Sciences. He was named a Hero of Socialist Labor (1973), deputy to the BSSR Supreme Soviet 8th, 9th, and 10th Convocations, winner of the USSR State Prizes (1950, 1972, and 1982) and that of the BSSR (1976); he was awarded the Gold Medal imeni S. I. Vavilov of the USSR Academy of Sciences (1967), named Honored Scientist of the BSSR (1967) and Honorary Doctor of Szeged University (Hungary).

In congratulating Boris Ivanovich Stepanov, prominent Soviet physicist, on his 70th birthday, the editors of this journal wish him good health and many long years more of fruitful, creative work to the renown of our science.

[Question] In the article "The Doctrine of Karl Marx and Certain Problems of Building Socialism in the USSR," the general secretary of the CPSU CC, Comrade Yu. V. Andropov writes about the fact that today it is particularly urgent to have a universal acceleration of scientific and technical progress, along with a more active utilization of its achievements. This assertion flows directly from the Marxist-Leninist thesis that science, to an ever-increasing degree, is becoming a direct force of production. Its manifestation of this capacity is clear and obvious when it is a matter of applied problems. But how do matters stand with regard to basic research problems?

[Answer] Your question still contains, it seems to me, a certain opposition between basic and applied science. In my view, this should not be done. The applied sciences, if they do not rely on the results of preceding basic research, are simply lacking in meaning. They cannot provide production with any sort of qualitatively new solutions, they are narrowly utilitarian in nature and hardly facilitate technical progress. In their turn, basic research studies which are not oriented toward creating equipment and technology for the immediate or more remote future are essentially senseless. At the present time science has become a productive force in human society; the development of science and production are interconnected and conditioned. .

[Question] Pardon me for interrupting you, but I do not wish to be misunderstood. In the previous question I used the term "problems"--applied and basic. Of course, there is a difference between the two. Would you prefer to speak about science on the whole? Well, all right, let's proceed down that path. It seems to me, for example, unfounded to divide science into some kind of terminological or departmental, in short, into any formal "compartments." Either it is science or it isn't. Its business, in the first place, is to gain knowledge of the new, to discover the possibilities for its continuing development. The following statement by Academician M. A. Lavrent'yev seems to me to be very convincing: "There are no useless discoveries. One cannot tell the scientist: stop your searchings because they are not needed by industry. By discarding with scorn research which today seems abstract...we are risking the danger of losing a great deal, for knowledge gained of the previously unknown forces of nature is always by a mastery of these forces."

[Answer] This is also justifiable for physics, which I have been studying now for almost 50 years and, obviously, for all other natural sciences. The highest goal of science is not only to gain knowledge of the world around us, but, at the same time, to transform it, to develop the productive forces of human society.

What was stated above has been confirmed by the entire practice of the scientific research and, in particular, the experience of the Physics Institute of the USSR Academy of Sciences. Here is an example. For many years the laboratory of molecular spectrum analysis studied the infrared spectra of multi-atom molecules of the hydrocarbon type (especially cellulose). The spectra of these molecules contain a large number of lines of various intensity. The first task of the scientist is to find the correct grounds for

the origin of all these lines, to explain the dependence of the spectrum on the composition and structure of the molecule, to find the lines which characterize the fluctuations of these or other connections, groups of connections, radicals, to learn how to determine the composition and structure of the molecule by its spectrum. This was the first stage of the scientific study in the course of which its applied possibilities were already being examined. As was supposed, the spectra of the hydrocarbons turned out to be extremely sensitive to changes of structure. Thanks to the elucidation of this circumstance, at the second stage of research in conjunction with the chemists we succeeded in solving a significant number of purely theoretical problems aimed at creating new materials which would possess further given properties. The use of spectroscopy enabled us to investigate many details of the chemical process. As a result, we developed, in particular, a new and progressive technology for processing bast fibers; this yielded a considerable economic effect, exceeding several times over the outlays for maintaining the laboratory over the course of 20 years.

As may be seen from this, in the given case basic research was conducted parallel with applied research. And, further on, the results of applied investigations immediately became the basis for new quests, for new basic research. Essentially what takes place is a unified, continuous process. Let me give you another example. In 1966 our institute created a new, particularly promising type of laser system--optical quantum generators in dye solutions. This work was marked by a USSR State Prize. At the present time lasers in dyes are widely used. Their principal property is their capacity to receive laser radiation throughout the entire visible field of the spectrum and, furthermore, as distinct from many other systems, to smoothly reconstruct the length of the wave of the light being generated. This result, which is very important for practical use, arose on the basis of many years of basic research. Allow me to note that the possibility for carrying out the generation of dyes with all their unusual properties was predicted in our institute on a purely theoretical basis in 1964. Now the study of the generation of light by solutions and pairs of dyes is being unfolded in many scientific institutions.

Basic and applied research are practically indivisible; one is closely bound up with the other. Within the framework of a major physics (chemical, technological) institute it is necessary that they be combined closely together, form a unity, and even merge.

Comparatively recently at the USSR Academy of Sciences Physics Institute in studying the properties of dynamic holography we discovered a new phenomenon--inversion of the phase front. But now it is already being used in many institutions for solving the practical problems of adaptive optics and laser technology.

At the Institute of Genetics and Cytology of the BSSR Academy of Sciences, with the participation of our institute, as a result of laser irradiation of wheat seeds, a form was obtained which surpassed the original species in crop yield by 4--6 quintals, and with regard to protein content in the grain--by 2--3 percent. Here basic and applied research are already merged together.

It is my profound conviction that applied research can be divided from basic research only in the already stagnant fields of technology and engineering, fields where it is difficult to anticipate any serious changes or a serious increase in labor productivity. But any qualitatively new solution in the process of production is linked with the results of basic scientific research.

[Question] I would like to have your comments on the following statement made by F. Engels: "If...technology depends to a considerable extent on the condition of science, then to a much greater degree science depends on the condition and needs of technology." It is clear that this is not just a matter of providing an up-to-date instrument base. What is the essence of this feedback connection today?

[Answer] The statement by F. Engels is timely even for our own period. Of course, it is not a matter of the enormous changes in the techniques of experimentation, but rather precisely in the needs for new techniques. We scientists are always talking about the need to improve our scientific topics, about cutting down on obsolete studies, on searching for new directions with good future prospects. This, by the way, is very difficult. Of course, the development of science is subordinate to its own particular specific laws. They cannot be dismissed with a wave of the hand, they must be studied, and they must be followed. But, at the same time, the development of science does not proceed in an airless space, but rather under specific historical conditions, amid the circumstances of an acute ideological struggle between two systems--socialism and capitalism. Soviet scientists are at the leading edge of this struggle. Therefore, the patriotic duty of scientists consists in the fact that, while knowing and understanding the inner laws of development of this or that specific branch of knowledge, they utilize them in order to correctly guide their own scientific activity, for choosing the topics with the best possible prospects, the most correct forward movement. I call correct that forward movement which to the maximum degree takes into consideration both the long-range prospects as well as the most immediate needs of social production, that which facilitates scientific-technical progress and strengthens the might of our Motherland.

And a few more words on this subject. Topics of research constitute the most important factor determining the effectiveness and operational results of any institute. The scientific topics of any institute cannot and must not be ossified. We must not proceed merely along the usual paths. Life and production march forward, the front of scientific research is inevitably being transformed, deepened, new ideas are rising, as well as new directions. That which is good today may become unsatisfactory tomorrow. It is precisely for this reason that the topics of scientific developments must be mobile and up-to-date. We need an uninterrupted quest, a quest for the main thing, the most essential thing. We must not live only for the present day, we must also consider tomorrow, to see the future prospects, to work out and adopt solutions which give promise of success for the future. By the way, this holds true not only for institutes but also for any laboratory

or for any scientific staff worker performing research on his own. At certain stages of his life a scientist should change the direction of his research. Sometimes very sharply. This ensures the transfer of methods from one field of knowledge into another, and it facilitates the emergence of something new.

[Question] You said--the emergence of something new. But, of course, it is probably not easy to decide on such a step. For years a man, so to speak, carved out his own path in science, and suddenly to turn from it.... Obviously, such a step, if we return to 30 years ago, was also involved in your arrival in Minsk, was it not?

[Answer] To a certain extent, of course, that is true. The postwar years in utterly devastated Minsk were very difficult. It was necessary to restore the national economy and to establish a peaceful life and, although a great deal had already been accomplished by the beginning of the 1950's, this republic still acutely felt the necessity of training scientists and specialists, as well as for developing physics, mathematics, and the technical sciences. We knew that, and when the BSSR Academy of Sciences turned for aid to its Leningrad colleagues, Anton Nikiforovich Sevchenko (our institute's first director) and I came to Minsk. We taught optics and spectral analysis at the newly formed university departments of these subjects, while looking out for and attracting to scientific work the most gifted and industrious students. Within two years they became the first staff members of the new Physics Institute. This institute later gained academic status, but at first it comprised only 13 persons: three doctors of sciences (A. N. Sevchenko, F. I. Fedorov, and myself), one candidate (N. A. Borisevich, who is now an academician and president of the BSSR Academy of Sciences), while the remainder were junior scientific staff members and graduate students.

At that time we decided to specialize in the field of optics and spectroscopy. And this was hardly by chance. The period of the institute's development coincided in time with the stormy, I would say revolutionary, changes in these sciences. After many years of stagnation spectroscopy sharply changed its profile and became active.

Those of us who were a bit older predicted these changes and possibilities to a considerable extent, and we attempted to infect the young researchers with our own convictions. At that time we were working almost around the clock, despite the crowded conditions of the rooms and the complete lack of instruments. The future pride of our institute, who were simply unknown graduate students at that time, spent quite a bit of time in a closely packed little room with two lathes, one drill, and a defective milling machine, attempting to set up their own first few experiments.

Optics itself changed before our very eyes. Rising on its basis was a whole series of new sciences and, in particular, holography, quantum electronics, non-linear optics, integral optics, laser spectroscopy.... The Physics Institute group was able not only to react in a timely manner to the rapidly

[illegible] in the directions of optical science but also actively participate in the emergence of its new branches. This was required and is required by life itself.

[Question] If we may, Boris Ivanovich, let's loosen up the clasp a bit. What I have in mind is a somewhat more detailed account of the possibilities of present-day physical optics which have been realized in practice, or to be more exact, those of its trends in which your institute is specializing.

[Answer] As is known, the common spectral methods have already been used for a long time in analyzing metals and alloys, electrolytes and enamels, slags and glasses; in transportation--for determining the degree of wear in engines; in chemistry--for analyzing potassium salts and determining non-organic admixtures in synthetic fibers, etc. And lasers, since they do not destroy and do not deform the object of research, enable us to determine the composition of particles which are only 60--70 micrometers--thousandths of a millimeter--in size. With their aid one can study the heterogeneity of the distribution of elements in a sample, analyze extremely fine wires and metallic tapes, determine the thickness and composition of various coatings. In [illegible] the economic effect from introducing the methods of modern-day [illegible] analysis amounts to millions of rubles per year.

During the next 15--20 years we must anticipate a radical change in the technology of many production lines. Already now use is being made of light processing and strengthening of materials, laser welding, cutting, and drilling. Laser chemistry has come into being, i.e., the science of chemical transformations under the influence of light. Laser radiation is also used in biology for actively influencing the living cell, stimulating its growth, or, in contrast, to destroy it, in connection with the treatment of many diseases, particularly in ophthalmology and surgery.

Up to the present time many practical applications of lasers, especially in medicine, have been based on the method of trial and error. Different lasers act on the cell in different ways. And one and the same ray may have different effects on different tissues or organs. The selectivity of biological effects of laser rays may be manifested here not only on the tissue and cellular but also on the sub-cellular level. Taking into account that every substance, including also biologically active compounds--ferments, vitamins, hormones--is characterized by its own spectral absorption, biologists hope to learn how to influence the exchange of substances within the organism. But for this we need, first of all, to distinguish in the fine points of the mechanism effects of light on the living cell.

And if we are to speak of specific applications of laser instruments for medical purposes, then allow me to mention that in one of the oblast stomatological polyclinics an office of laser therapy has been opened: the treatment of tooth enamel with a laser ray makes it more resistant to caries. In Minsk they have begun to develop methods of laser neurosurgery, and arthritic patients have already begun to be treated successfully with the aid of laser instruments. What more noble mission than this can the laser beam have?

[illegible], let me say that the development of science needs to look ahead, and for this we need to know, in particular, the needs of production and society. Only that scientific institution can cope well with its own topics where a continuous search is being conducted for what is new and what has good prospects, the topics of which are continually changing (of course, for the better).

/Question/ There is such a concept as the responsibility of the scientist. I do not have in mind the problems of nuclear, genetic engineering and the like, which in criminal hands could bring mankind not only harm but also physical destruction. But, you know, this responsibility also exists in other fields. What is it and what is it for?

/Answer/ At the present time the accelerated development of productive forces is connected, to a considerable degree, with the scientific-technical revolution which has been unleashed throughout the world. What is occurring is a substantial change in the nature of work, the replacement of manual labor by machine labor, along with the partial or full automation of production processes. The role and responsibility of the scientists in this matter are extremely significant. As I have already stated, they must approach their own work creatively, seek out and find the new, achieve a situation whereby their ideas and proposals may find practical application as rapidly as possible. The state spends large funds on science, and they must be utilized rationally; they must bring about significant economic and social effect...

At the same time, the responsibility of scientists to society does not, of course, differ from the responsibility of a worker, engineer, agronomist, lawyer, writer, performing artist, or party worker. They must all do their own work well.

On the other hand, we do have one specific trait. I have in mind the responsibility for training our scientific replacements. For a long time it was precisely this which we at the institute considered to be our main task. Now we can say with a clear conscience that it has been basically solved. A number of new scientific centers have appeared in this republic, engaged in the study of basic and applied physics. Many of them are headed up by our former students. But now we must solve a new and responsible problem: to redistribute personnel. You know, science must develop not only in capitals. For example, the Mogilev Division of our institute is operating successfully; it has become a serious institution with its own direction and body of scientific topics. A number of talented scientists who have graduated from our school are employed in the Belorussian Polytechnical Institute and at Gomel University. Candidates and doctors of sciences who have been trained in Minsk are also working beyond the borders of our republic.

/Question/ What does it mean in science to adopt a solution? I do not have in mind factors of the inner life of a group, nor even more so the administrative tone in scientific matters: we well remember what an unpropitious

This can even happen in such methods as the testing of a number of very important truths. But, you know, even in scientific questions the director must make decisions. On what basis is this done?

[Answer] Scientific work is a creative process. It is precisely for this reason that excessive administration in science can really bring only harm. A scientific director must, above all, demonstrate by his own personal example a self-sacrificing attitude toward work, an unceasing quest, a struggle against stagnant lines of research and those with poor prospects for the future. He must work "24 hours a day." And then the young scientists and the entire scientific group will render him all kinds of support. A scientific director should be proud of the successes achieved by his own disciples, stimulate their independence in every way and develop in them high standards for themselves. We must not compel our subordinates to conduct research in this or that scientific line. They must be convinced, made interested, and attracted! We must also listen to their own opinions.

I have worked at the Physics Institute for many years, and I do not recall a single instance when a decision was made without the support of the basic mass of the staff members. In 1961 after the appearance of the first laser, the topical agenda of the institute was sharply changed: 50 percent of the staff members switched over to working on the solution of the problems in quantum electronics. But this was done not by means of any sort of order from on high, but after interesting discussions, examination of the experience of the Muscovites, and after the first interesting projects in this field.

[Question] In one of his articles Petr Leonidovich Kapitsa wrote about the importance of a healthy scientific environment for the formation of a scientist. He emphasized the fact that the creation of such an environment is a matter more difficult than the instruction of talented young persons or the building up of large institutes. A healthy scientific environment permits an objective evaluation of a person regardless of scientific authority or official position, it allows us to clear the scientific atmosphere of the pollution of careerism, vanity, and cowardice, it helps preserve everything useful for our science. Where there is no such environment there reigns a banal spirit of compromise, there is a diminution of the role of moral requirements and principles. In other words, we are talking about the climate in a scientific group. How is this defined?

[Answer] Our institute has a fine moral climate. In order to create such a climate, it is necessary that the overwhelming majority of scientific staff members actively participate in discussing and solving scientific and scientific-organizational problems confronting the institute. This is what is called collective leadership. It is necessary that the party, trade-union and Komsomol organizations, scientific council, and its numerous commissions operate well. It is necessary that the institute's director respect his own staff members, trust them, while they, in turn, respect the director. It is also essential that the constant aim of the social organizations, activists, and directorate of the institute be focused at revealing and eliminating shortcomings, as well as developing a critical attitude toward the work of all the institute's units.

We had a case--a doctor of sciences, a laboratory director was not re-elected to a new term. And for good cause. He had become swell-headed, had ceased to work actively, and ascribed to himself the work of his own staff members. His failure in the election, in my opinion, is a testimony of the healthy moral climate in the group.

Our basic task at this level is to inculcate feelings of patriotism, collectivism, and responsibility in every staff member for the work of the entire institute, and the institute for the work of every scientist.

[Question] The strength of this group is well known. But does this mean that some kind of "collective Newton" is possible? Or are Newton and the group necessary? What is the inter-connection here?

[Answer] Actually, you yourself have answered this question in part. Collective creativity has not replaced the creative work of the individual. In a good group each of its members must be quite independent. Without the unity of individual and collective work the development of medern science would be completely unthinkable.

The following legitimate connection exists: the creative possibilities of the staff members determine the potential of the scientific institute, while the level and timeliness of the institute's topics increase the qualifications of its staff members. Here too it is extremely important to select the scientific problems with the best prospects and to know how to concentrate significant forces around them. No less important in forming a scientific group is the recruitment of staff members, the persistent search for good, young scientific prospects among the younger students, beginning in the third year of their course work. This search should be combined with a concern for the scientific training of youth, with offering it the necessary independence and, at the same time, a constant upgrading in the requirements for acceptance in graduate work, passing candidates' exams, various certificates, and dissertation defenses. Yes, young persons should be trusted, but no kinds of allowances for youth need be made.

Genuine science, I underscore this, genuine science is not only intense hard work but, at the same time, a source of inspiration, joy, and true human happiness. If someone does not feel this or understand it, if for him science is only a trade and a source of material well-being, then he is not worthy of engaging in scientific studies; he would be better off choosing another path in life.

[Question] It sometimes happens that people are beaten for stubbornness and punished for initiative (albeit indirectly); they are envied for their creative productivity; a person capable of doing good work is loaded down until he becomes exhausted, while behind his back the "mediocrities" sit smug and imperturbable. How should we combat this? You know, mediocrity in science, particularly that which has attained certain commanding heights, is a phenomenon which is not simply useless but harmful, for mediocrity actively gives rise to its own imitators.

[Answer] The only means of combatting mediocrity consists of lively, creative discussions, the activeness of the party organization, and a situation amenable to criticism and self-criticism, something inherent to any vital group. I agree with you in everything pertaining to mediocrity, especially that which has come to occupy the commanding heights. The means of combatting it have long been known--it is not to yield these heights and using for this purpose the possibilities fully in accordance with the law. I have already cited one example from the practical experience of our institute.

[Question] When it is reported that this or that institute has received an award, then it is understood that quite a bit of this is due to its director. But he could hardly have achieved this success if the group itself had not contained certain strengths, which had to be sensed and stimulated. Just what are these strengths?

[Answer] The strengths which you are speaking about I have already mentioned. They are a sense of responsibility of each person for the work of the entire group, a love of science and his own institute, an unceasing sense of what is new, and unflagging, everyday work. Capabilities in science are not enough in themselves; one needs enthusiasm and hard work.

In planning the work of the entire institute and each individual staff member, we attempt to solve the basic problems which are changing the face of our science, to ensure a substantial national-economic or social effect, as well as the output of new technology. The development of productive forces, and not simply acquiring a knowledge of the laws of the world around us--this is the final and most noble purpose of science in general and of each scientific group in particular.

We have gained our place in science as the "laser" institute by utilizing the ideas set forth by our staff members. This led to success. But, as is well known, both people and ideas grow old. That which was a brilliant discovery yesterday is an everyday commonplace today. We need to search for something new again. And when the forces are found to search for this new thing, then [illegible].

[Question] Wherein do you see today the social duty, the social role of the scientist?

[Answer] Our highest duty today, as it was yesterday, is to serve the Motherland, to be concerned for the priority of Soviet science and for solving the top-priority problems of the scientific-technical revolution.

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IMPROVED PLANNING FOR LOCAL TERRITORIAL UNITS URGED

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[Article by I. Barminskiy, deputy chairman, Zheleznodorozhnyy Rayispolkom, Vitebsk, planning commission chairman: "High Degree of Effectiveness for Local Territorial Plans"]

[Text] As one of the most important factors for improving the administration of the socialist economy, the 26th CPSU Congress designated the need for combining sectorial and territorial planning, ensuring on this basis the comprehensive and effective solution of economic and social problems at all levels of the national economy.

An important and ever-increasing role in this matter has been relegated to the local Soviets of People's Deputies. It is precisely they, in accordance with the USSR Constitution and the BSSR Constitution, who are embodying the principle of unity between the territorial and sectorial administrations; they are responsible for both the development of production and for improving the quality of social, everyday, and cultural services to the public.

The local Soviets of People's Deputies have been granted extensive rights for coordinating the activities of all enterprises and organizations located on the territory under their jurisdiction. It is not by chance that our rayispolkom often receives requests to influence undisciplined suppliers and related industries, to improve the work of enterprises in the service field, to render assistance in developing the production and social base, etc. We regard such requests as evidence of the great authority which is enjoyed by the local organs of power among economic managers and among all Soviet people.

However, in and by themselves the rights which have been granted cannot ensure the solution of the problems confronting a specific city or rayon, nor the correct combination of general-state and local interests. We need an appropriate instrument or system for implementing these rights. And such an instrument, allowing us to combine sectorial and territorial planning on the level of cities and administrative rayons, have become the comprehensive one-year and five-year plans for economic and social development.

But how do these plans differ from those which were developed earlier? First of all, by the fact that earlier planning was done only for the development

of the local economy, i.e., that which is under the jurisdiction of the ispolkoms of the Soviets of People's Deputies. But now the planning encompasses all enterprises and organizations located on the jurisdictional territory, regardless of their subordination--All-Union, Union-republic, or local.

As is known, the initial local comprehensive plans began to be worked out at the end of the 1960's in Moscow, Leningrad, Donetsk, Minsk, and several other cities. During the 1970's comprehensive planning for the development of administrative territorial units, including urban rayons, became widespread.

A certain amount of experience in working out comprehensive plans for economic and social development has been accumulated in the city of Vitebsk and its administrative rayons. The first such plan, for example, in our Zheleznodorozhnyy Rayon was drawn up during the Ninth Five-Year Plan. It marked the transition from planning the socio-economic development of individual production groups to the system of "enterprise--urban rayon--city." The first few attempts were undertaken to unify the plans of enterprises, to make them a component part of the rayon's plan, and the latter--a part of the overall city plan.

This does not mean, of course, that previously in the rayon enterprises and organizations at a higher rank were developed without coordination with the rayispolkom. However, there was no unified plan document which would encompass all aspects of life in the rayon. Indicators of the socio-economic development of the entire national economy of the rayon were not provided anywhere by anyone in a full scope or in an organic unity; there was no such planning.

Meanwhile, the constant growth in the scale of production, the growing complexity in the structure of the social-sectorial complex, the increase in the number of enterprises and organizations in the rayon demanded new methods of administration. Let me say that our rayon at the present time constitutes a complex entity which combines within itself in definite proportions all the leading sectors of the economy: industry, transportation, construction, the public-service sphere, public education, health care, etc. Located on its territory are 23 industrial enterprises, which annually turn out more than [illegible] million rubles worth of products. Eleven construction organizations annually perform construction and installation operations with a volume amounting to 44 million rubles. Ten secondary schools provide instruction for [illegible] pupils. The housing stock comprises more than 800,000 square meters of total space.

Naturally, this entire socio-economic complex is in a state of constant development. During the 10th Five-Year Plan the volume of industrial production in this rayon increased by 25.7 percent, by means of all sources of financing apartment houses were put into operation with a total space of 22,000 square meters, [illegible] new stores were opened, a House of Everyday Services providing 290,000 rubles worth of daily services a year was built and put into operation, etc.

Under the conditions of a multi-sectorial, dynamically developing economy, there is also an increase in the demands on the complexity of planning for economic and social development. Particularly if one takes into account the sectorial sources of financing. Located in our rayon are about 200 various enterprises and organizations, which are under the jurisdiction of several dozen ministries and departments. Each enterprise and organization has its own plan and the resources necessary to carry it out. The ministries and departments allocate capital expenditures to them along targeted lines for the development of a production base as well as the construction of cultural and everyday-service types of facilities. However, each enterprise and organization is incapable of solving in isolation the full scope of problems of rest and recreation for working people, housing and road construction, the development of a network of the service field, public welfare, centralized energy-supply, etc.

The necessity for combining the efforts of many on solving, primarily, social problems has also been dictated by the circumstance that in the rayon there is a predominance of medium-sized enterprises (only 9 of them have a number of employees amounting to more than 1,000), which for understandable reasons are difficult to build, for example, the House of Culture, kindergarten-nursery, dormitory, and so forth. Furthermore, the large enterprises still do not allot sufficient funds for such facilities. They are more concerned with increasing production capacities, and this has led to disproportions in the rayon's economy. As a result, we have begun to get in recent years a lag in the development of the social sphere behind production: a housing shortage, insufficient provision by the enterprises for the service sphere, cultural institutions, etc. All this constituted still one more proof of the fact that under present-day conditions, along with further improvements in the sectorial administration we must develop in all ways territorial planning on the level of cities and rayons.

Experience in working out the initial comprehensive plans for the economic and social development of our rayon has shown that, with their help, we can solve many problems more extensively, cooperate with the funds and efforts of enterprises to achieve the common task--improvement in the working and everyday conditions of the inhabitants. For example, during the 10th Five-Year Plan, by means of co-opting the funds of industrial enterprises and coordinating their actions with the everyday-service workers, a solution was reached for the problems of expanding the network of workshops and repair facilities offering everyday services to the public. They built a fine House of Everyday Services, where the following were situated: clothing, footwear, and knitted-goods shops, a barber shop, photo studio, and workshops for repairing household appliances. Also opened in the rayon were other enterprises providing everyday services, including those at individual plants and factories.

Combining funds by means of working out a comprehensive territorial plan also allowed us to solve yet another important problem. There are no high-capacity, central heating facilities in our rayon. Therefore, many enterprises and organizations, particularly in the railroad microrayon, have built small-scale, low-capacity boiler units, which basically serve their own needs. It is well known that such boiler units are inefficient and also constitute a serious source of air pollution for the environment. Taking all this into consideration, we provided within the rayon comprehensive plan for a co-opting of funds

[illegible] of the Zapadnaya Main Heating Line. Of course, it would have been beyond the ability of any single enterprise to solve such a problem, but by joint efforts 1.5 kilometers of this main heating line have already been constructed. The construction of buildings and structures has allowed us to eliminate no less than 10 small-scale boiler units.

Joint efforts have also been employed to carry out large-scale operations in roadbuilding and public improvement of the rayon's territory. More than 200,000 square meters of streets and sidewalks have been paved with asphalt. There are also quite a few other examples whereby important problems have been solved with the aid of comprehensive plans.

Great possibilities for enhancing the role of local territorial plans within the system of national-economic planning were opened up by the decrees of the CPSU Central Committee and government entitled "On Improving the Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" and "On Further Enhancing the Role of the Soviets of People's Deputies in Economic Construction." The duties of local organs now include the drawing up and approval of composite five-year and one-year plans for the production of local building materials, the output of consumer goods, [illegible] for construction in the housing-communal and cultural-everyday-service fields, drawing up future and one-year balance sheets of labor resources, [illegible] participation in providing them by enterprises and organizations, and setting out within the body of the territorial plans [illegible] the entire complex of measures in the field of social development.

After we receive the draft five-year and one-year plans and proposals for [illegible] them to the higher-ranking organs, associations, enterprises, and organizations of all-Union and republic-level jurisdiction are obligated to send them for examination to the ispolkoms of the local Soviets. The decrees require that the USSR ministries and departments and those of the Union republics take into account the proposals of the local organs in determining, approving, and changing the plans of the associations and enterprises under their departments. The title lists of construction projects, regardless of their departmental jurisdiction, in the section on construction of apartment houses and facilities providing social, cultural, and everyday services, as well as the increase in the number of workers and office employees, provided for by the enterprises and organizations in the draft five-year and one-year plans, are subject to agreement and coordination with the local Soviets. The tasks of comprehensive development will be facilitated also by the transfer to the appropriate territorial jurisdiction of a number of enterprises and organizations whose products are used primarily on this same territory.

Many of the outlined measures have already been implemented, which facilitates the working out of better-grounded and more effective comprehensive plans. We requested the draft plans for the 11th Five-Year Plan for all the enterprises and institutions of this rayon. The planning commission thoroughly analyzed them in the section on housing and communal economy, roadbuilding,

[illegible] and [illegible] increased, the [illegible] [illegible], public improvement, [illegible], capital repairs of the housing [illegible] and [illegible] and [illegible] [illegible] [illegible] the [illegible] by the [illegible] [illegible] and [illegible].

[illegible] of the comprehensive plan for the economic and social development of [illegible] for the 11th Five-Year Plan, a large number of economic and social studies were carried out with regard to evaluating the level of development achieved in each sector of the [illegible] and the possibility [illegible] the [illegible] and [illegible] of [illegible]. For this purpose [illegible] comprehensive [illegible] was formed [illegible] [illegible] party and Soviet workers, specialists [illegible] economy, and [illegible]. [illegible] council commission [illegible] [illegible] with its sections. [illegible]. The planning commission [illegible] [illegible] explanations on how [illegible] and the development of [illegible].

[illegible] comprehensive plan have been defined in accordance with [illegible] functions and place of the [illegible] within the system [illegible]. It has provided for an increase in the [illegible] of the city's economic and social development, [illegible] the [illegible] by means of comprehensive [illegible] and rational utilization of [illegible] and outside resources, the [illegible] of a [illegible] of social conditions for the life of the population, [illegible] and cultural level.

[illegible] the planning commission, [illegible] of the [illegible] comprehensive plan were determined [illegible] 11th Five-Year Plan. It consists of the following three [illegible]: [illegible] development, 2) [illegible], the well-being and improving [illegible], 3) formation of a Marxist-Leninist worldview, improving [illegible] work, and organizing rest and recreation. [illegible] sub-divided into sub-divisions, which [illegible] and [illegible] indicators.

[illegible] comprehensive plan was [illegible] by the "Methodological [illegible] for the Comprehensive Economic and Social [illegible] and Cities of the [illegible] [illegible] Institute of Economics [illegible] under [illegible] and approved by the [illegible].

[illegible] to work on the comprehensive plan for 1981--1985 [illegible] of People's Deputies, as well as [illegible]. The plan which was approved [illegible] of all [illegible] of industrial [illegible] by means of [illegible] and

[illegible]

transition to two-shift operations, increasing production with fewer, mechanization and automation of engineering processes. For example, by means of introducing measures with regard to new equipment and technology it is planned over a five-year period to fully eliminate 244 jobs, to replace without reducing the workers manual labor by [illegible] labor for 275 jobs, and to lighten manual labor for 341 persons. [illegible] these measures, cost savings will amount to more than 2 million rubles, and [illegible] will be recovered within three years. The share of mechanizing workers' labor will rise from 70 percent at the beginning of the 11th Five-Year Plan to 79 percent in 1985.

It is planned to put into operation apartment houses with a total space of 40,000 square meters, to build new dormitories with 430 capacities, to expand the network of enterprises engaged in trade, public dining, and everyday services. A polyclinic capable of handling 600 visits per shift will be built on cooperative principles. Today it can be said with full confidence that much of what has been planned by us for the 11th Five-Year Plan and already partially carried out would have been impossible to implement without this comprehensive plan for economic and social development of this rayon.

However, our experience of working out the initial local territorial plans has also shown many of their shortcomings and imperfections. At the present time they [illegible] play an auxiliary role within the system of national-economic planning, since they are worked out on public principles and are lacking in the force of a directive. These plans are not mandatory for enterprises and are not sent to the ministries and departments. Except for the local organs, they are not further examined or approved by anyone else.

[illegible] true, comprehensive plans do allow us to follow up on the trends in the development of various sectors of the national economy, and they do provide a great [illegible] valuable material for analysis. However, in the form in which these documents are now being worked out, they cannot provide a completely comprehensive approach and cannot also eliminate many negative phenomena and disproportions in the rayon's development. You know, a comprehensive approach provides, in the first place, an organic coordination of all the interconnecting parts into a unified whole. As of now, the local territorial plans do not represent such a unity.

But wherein lie the reasons for such a situation? The shortcomings of the initial local territorial plans were connected, in our opinion, with the fact that, along with considerable administrative rights, the local Soviets of People's Deputies have inadequate rights and functions in the area of planning capital investments. All fixed capital assets are allocated along the lines of the ministries and departments directly to the targeted enterprises. Moreover, the system of planning capital investments for developing the production and non-production spheres is exactly the same and does not take into consideration their diverse roles within the system of the city or rayon. You know, if the volume of production, for example, of metal-cutting machine tools is determined on the whole by the needs of the country's national economy, then the volume of housing construction, the number of institutions for health care and culture depend on the number of the population

[illegible] will be [illegible], within the [illegible] of [illegible] [illegible] [illegible]'s [illegible] [illegible] [illegible] by the [illegible] of [illegible].

[illegible] is a [illegible] [illegible] [illegible] which has taken [illegible] [illegible] [illegible] [illegible] of [illegible]. It [illegible] that the local organs depend [illegible] [illegible] the [illegible] [illegible] basis for the construction of a [illegible]. However, the latter often [illegible] [illegible] [illegible] [illegible]. Thus, the [illegible] Ministry of the [illegible] [illegible] [illegible] [illegible] 10 years has allocated for the [illegible] of the [illegible] [illegible] [illegible] [illegible] [illegible] territory, [illegible] [illegible] of [illegible] investments. But for the [illegible] [illegible] of [illegible] of the [illegible] economy and social, cultural, and everyday service purposes it allocated [illegible] more than 10 percent of this sum. Furthermore, [illegible] [illegible] [illegible] [illegible] for a [illegible] [illegible] [illegible]. But, you know, [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] which are responsible for the [illegible] development of a given territory. It is precisely to [illegible] [illegible] [illegible] [illegible] their requests about improving [illegible] and [illegible], trade, [illegible], and [illegible] services.

[illegible] [illegible] [illegible] [illegible] examine the plans for the economic and social development [illegible] enterprises and to make their own conclusions and [illegible] [illegible], [illegible] [illegible] [illegible] [illegible] [illegible].

[illegible] [illegible] [illegible] [illegible] [illegible] the balanced development of the [illegible]. [illegible] local Soviets of People's Deputies can implement [illegible], [illegible] measures. Construct facilities for social, cultural, and [illegible] purposes, as well as engineering structures for general [illegible] [illegible] upon the [illegible] funds of enterprises. To a [illegible] [illegible], [illegible] [illegible] at the present time. However, the [illegible] [illegible] and [illegible] them in [illegible] and [illegible], [illegible] [illegible] [illegible], it requires a large number of [illegible]. [illegible] [illegible] difficult to [illegible] [illegible] [illegible] funds of the [illegible] [illegible] [illegible] [illegible] enterprises which is not being expanded, since [illegible] [illegible], are allocated only to plants and factories under construction.

[illegible] [illegible] [illegible], [illegible] [illegible], it is high time that we created a [illegible] [illegible] of [illegible] capital investments for social, cultural, and [illegible] [illegible]. Local territorial plans must be [illegible] [illegible] [illegible] [illegible] problems which are not being solved [illegible] [illegible] of People's Deputies in the field of economic [illegible]. [illegible] [illegible] funds allocated for the construction of housing, [illegible] [illegible] buildings, facilities [illegible] the purposes of [illegible], culture, and health care must not be dissipated throughout numerous [illegible] [illegible] [illegible] of the economy, but rather transferred to [illegible] [illegible] the local organs of administration. It would also be [illegible] [illegible] [illegible] [illegible] to determine what should be built first. [illegible] [illegible] [illegible] the appearance of [illegible] at the present [illegible] [illegible] [illegible] [illegible] [illegible] in the [illegible] of a [illegible]. [illegible] [illegible] [illegible] the local Soviet would be

mechanism for providing housing for people, regardless of where they are employed. The same kind of procedure could also be established for other components of the social sphere.

The system of financing the construction of the engineering structures of the production infrastructure (water-supply, sewerage, heat-supply, etc.) should be founded, in our opinion, on the cost-accounting relations between the local soviet and the production enterprises of the higher-ranking jurisdiction (in the form of payments for their use of natural resources and the services rendered). All that needs to be worked out and established are the appropriate rates.

Such measures will make it possible to [illegible] regularize non-production construction and the development of general-purpose engineering structures, which will find a single customer. They will permit the elimination of differences in providing enterprises with facilities of housing, social, cultural, and [illegible] domestic-service purposes. [illegible] know, at the present time, the advantages [illegible] are possessed by the large enterprises, although, as is well known, the work of all employees is important. But because of the lack of cultural-domestic-service facilities at the medium-sized enterprises, as practical experience has shown, a large personnel turnover is to be observed. In our rayon, for example, at enterprises with a number of more than a thousand persons the personnel turnover does not exceed 10 percent a year, while, at the smaller ones (with less than [illegible] persons) it often reaches 30 percent or more, i. e., the labor group changes every year by one-third.

Further enhancement of the role of the comprehensive territorial plans, in our opinion, is impossible without improving the activities of the local planning commissions. For it is precisely they who must take the place of that staff, the center of planning work, where the prospective, [illegible]tegic decisions are, if one may so put it, born.

The November (1982) Plenum of the CPSU CC defined as an extremely important task the raising of the level of work to further improving the planning and administration of the economy. Naturally, its successful implementation will facilitate and perfect the local territorial plans.

[illegible]: "[illegible]" No 6

[illegible]
CSO: [illegible]

EFFECT FROM INTRODUCTION OF NEW TECHNOLOGY IN THE GEORGIAN SSR

Tbilisi ZARYA VOSTOKA in R[illegible]an 6 Mar [illegible] p 2

[Article by Irakliy Zhordaniya, deputy chairman, GSSR Gosplan]

[Text] A number of decisions on the improvement of planning and control of the introduction of scientific and technical achievements into the national economy, adopted in the republic in recent years, [illegible] connection of control of scientific and technological progress with the general economic administration and inclusion in plans of new technology and real khozraschet activity of the ministries, industrial associations and enterprises. This has had a positive effect on increasing the rates of development of the economy of the republic and improvement of its branch structure.

Substantial changes have been introduced into the state plans for new technique. They have been correspondingly supplemented and expanded. Now the plans are being worked up for the territory as a whole, with the inclusion of associations and enterprises of the union ministries and departments and closely corresponding to the methodical requirements of the USSR Gosplan for the working up of plans of economic and social development.

Side by side with tasks of the union and republican levels, for the first time tasks have begun to be controlled which have been approved by union ministries and departments. Today the drafts of plans contain tasks of union and republican purposive complex scientific and technical programs. For the first time, completed scientific research work done by institutes and VUZ's of the republic and recommended for introduction by the State Committee for Science and Technology and the GSSR Academy of Sciences have begun to be included. The prepared drafts of plans of recent years have been positively evaluated and approved in the USSR Gosplan, and some of the novelties introduced by us have been proposed to union republics for their use in planning. The balancing of the plan for new technology with the material, equipment and financial resources has been considerably improved. Since 1981 the industrial ministries of the GSSR have been setting tasks in the reduction of the cost of production, growth of productivity and the degree of mechanization of labor on account of elevation of the technical level of production, which is practiced only in our republic.

In 1980 in comparison with 1975 the economic effect from the introduction of new technology more than doubled. This positive tendency is also being continued in

[illegible] five-year plan. In 1981 the saving amounted to [illegible] million rubles, and in 198[illegible] [illegible] preliminarily, estimated to be [illegible] million rubles.

In the course of 1982 in the republic more than 700 measures were implemented on the organization of new types of industrial production, the introduction of advanced technology, the mechanization and automation of production processes and other directions of scientific and technological progress. By the joint efforts of scientific research and planning and design organizations and industrial enterprises of the republic in 1982 in machine building alone the output of more than [illegible] [illegible] of new types of equipment, apparatus, instruments, etc, was organized, the technical level of which corresponds to or elevates the level of other foreign or domestic analogs. They include a semi-automatic thread-cutter for drill rods, a [illegible] machine with a [illegible] air heater and a line for sorting semi-finished [illegible], a [illegible] hydraulic [illegible], an electric [illegible] with a load capacity of [illegible] tons, submersible electric motors of various types and a number of analytical instruments. Prototypes and an adjustable [illegible] of a pipe-cutting automatic machine, [illegible], an electric welding unit, an information [illegible] device, etc., have been manufactured.

[illegible] types of machines and equipment are characterized by elevated technical level and [illegible]. Thus, the [illegible] semi-trailer [illegible] to the truck-tractor KAZ-[illegible] and the trailer [illegible], besides the greater productivity and operating quality, has high fuel economy.

The production of complexes of equipment for loading [illegible] and cable-ways for the transport of agricultural products of the type "[illegible]-1A" and "[illegible]-2A", and [illegible] of a special suspended cable-way, has been organized. Noted are new technological processes directed toward saving of material and energy resources and the use of production wastes. Thus, at the Zestafoni ferroalloys plant they have organized a technology for processing castings of silico-manganese slag and increasing the manganese extraction by [illegible] percent, which is equivalent to the additional use of about 30,000 tons of a valuable raw material.

The area of application of plastic parts has been expanded (at a planned 2055.2 tons it amounted to [illegible] tons) and of parts made by powder metallurgy (316 tons were obtained at a planned [illegible] tons). The execution of these measures permitted machine-building enterprises of the republic to save about 22,000 tons of rolled products of ferrous metals.

For the first time manipulators have been introduced for the assembly of heating and [illegible] apparatus at the Tbilisi [illegible] apparatus experimental plant and on the [illegible] manufacturing line at the "Elva" Scientific Production Association. At the "[illegible]" Production Association a metallized purification complex has been put in operation, the saving from the operation of which has amounted to [illegible],000 rubles. Machines have been introduced for the extraction of [illegible] in [illegible] fields, which has increased labor productivity of coal cutters by [illegible] percent.

[illegible] with the achieved successes there are substantial shortcomings and [illegible] in the matter of introduction of achievements of science and technology in the national economy. The plan for the quantity of [illegible] has been fulfilled by [illegible] percent, and for the volume of completed work by [illegible] percent. Including for

the organization of new types of industrial production by [illegible] percent, the introduction of progressive technology by [illegible], the mechanization of production processes by [illegible] and the automation of production processes by 30.1 percent. On the whole for the republic [illegible] tasks were not fulfilled, including [illegible] not fulfilled partially and [illegible] not fulfilled at all.

At the "[illegible]" Scientific Production Association the further organization and production of motorized units with [illegible] hp engines has been discontinued and [illegible] units manufactured earlier have not been fitted with [illegible] and drawn implements. As a result the agriculture of the republic has received [illegible] units of motorized units less than contemplated by the plan. The task has not been [illegible] on [illegible] organization of a gasoline-electric unit, which has prevented use of over 2000 manually operated motorized tea-[illegible] and tea-drying installations, on the manufacture of which about [illegible] million rubles have been expended. At the Rustavi chemical fiber plant, due to delay in reconstruction of an extrusion unit, the [illegible] task has not been fulfilled on the production of high-[illegible] high-strength thread [illegible] tons. The plan for organization of new types of [illegible] has been disrupted and there was under-delivery of [illegible] tons of [illegible]-making polypropylene twine and 1677.[illegible] tons of filament texturized anti-static thread, [illegible] unsatisfactory delivery of raw material. The plan for organization of the production of a new type of production--electrolytic manganese dioxide--was not fulfilled.

It must be noted that with only two enterprises of the city of Rustavi--a chemical plant and a chemical fiber plant--due to the non-fulfillment of measures provided for by the plan for the development of science and technology the national economy under-received in 1982 finished product amounting to 30 million rubles.

In spite of the adopted measures, no transition was achieved in the work of the "[illegible]" Construction Trust. Due to non-completion [illegible] of construction at the [illegible] "[illegible]" Plant, three automated warehouses were not put in operation. Because of an interruption in execution of the production plan at the Kutaisi automobile plant the tasks on completely mechanized production of [illegible] and [illegible] were not fulfilled in complete volume.

The state plan for the introduction into construction of progressive technology and the mechanization and automation of production processes envisaged the performance of [illegible] measures. In [illegible], those performed amounted to [illegible] percent. The unsatisfactory use of the railroad container pool, the turn-around of which was [illegible] days as against a norm of [illegible] days, (that is, it was delayed by [illegible] percent), and also the absence of coordination of work between services of rail and motor-vehicle transport were the main reasons for non-fulfillment of the state plan for transport of goods in universal containers. At a planned 60[illegible],000 tons, 557,000 tons were shipped. In view of the fact that the Ministry of Instrument Making, Automation Equipment, and Control Systems did not complete start-up and adjustment work in the system of [illegible] and automation of pipeline container transport, the task of transportation of gravel and sand from the "[illegible]" quarry to the reinforced-concrete articles plant in Tbilisi in a volume of [illegible],000 tons was not carried out.

As a result of classification of the reasons for non-accomplishment of measures in the last two years the following picture was revealed: [illegible] percent of the planned

[illegible] losses due to interruptions in [illegible] of the [illegible]: [illegible] percent as a result of [illegible] of the planning documentation, which was issued in the course of the introduction of new technology and equipment, [illegible] percent due to [illegible] of materials and equipment, [illegible] percent because of non-fulfillment of the plan of construction and installation work, and also due to [illegible] of specialized teams of the [illegible] and other highly qualified specialists, [illegible] percent as a result of poor organization of control in the field of planning of the introduction of new technology. As analysis has shown, [illegible] there are definite reserves for the attainment of better final results. Realization of the number of measures of [illegible] [illegible] material and technical resources were not provided [illegible] of [illegible] of the [illegible]. The basis for non-fulfillment of these measures is poor organization of the control of processes of introduction [illegible] by the ministries, departments and [illegible] on the [illegible] of the republic. And in that direction we find new ways to act: at weekly conferences of the [illegible] on new technology, specific questions connected with execution of the plan are discussed. An operations staff is created [illegible] of a [illegible] section of science and technology which will [illegible] the solution of questions presented to us by the union ministries, departments, the State Committee for Science and Technology and the USSR [illegible]. In addition, a number of other measures have been prepared which, in our opinion, already in the current year must substantially improve the fulfillment of [illegible]. Great hopes are placed in help on the part of working groups created by decision of the [illegible] Plenum of the CP Georgia Central Committee. As [illegible] shows, the [illegible] Five-Year Plan and [illegible] years of the current Five-Year Plan are characterized by high rates of growth of economic effectiveness. Calculations [illegible] have shown that there are all the prerequisites for a sharp increase of [illegible] indicators in the future. The bases for achievement of such results have already been prepared today. In [illegible] it is proposed to bring the saving to [illegible] million rubles, and to [illegible] million rubles by the end of the Five-Year Plan, that is, to obtain in the last [illegible] years of the Five-Year Plan a saving equal to that of the entire last Five-Year Plan.

At the [illegible] Plenum of the CP Georgia Central Committee it was said that such a great effect is given by the practice of concentration of efforts from the point of view of achievement of high final results in the area of further acceleration of scientific and technological progress. This means that it is necessary to have a [illegible] approach in the plans of all scientific and production activity and an organic interconnection of the plans of science, technology and production. And in the [illegible] Five-Year Plan the tasks of the national economic plan are based on the [illegible] development of science and technology and the introduction of their achievements into all spheres of material production and the life of society. [illegible] by planned union of science and production. In essence this means that the system "science--technology--production--consumption" becomes an object of state planning, that the organic connection of plans of scientific and technological development is accomplished on ever-broader scales and at all levels of control: national economic, interbranch, regional, and of associations and enterprises.

[illegible]
CSO: [illegible]

SCIENTIFIC-PRODUCTION COMPLEXES ORGANIZED IN GEORGIA

Tbilisi ZARYA VOSTOKA in Russian 30 Mar 83 p 2

[Article by Zakhariy Papava, secretary of the Party Committee of "MION" scientific research institute with plant]

[Text] Acceleration of scientific and technological progress and transition of the economy to an intensive path of development, side by side with stable forward development of the national economy, more efficient use of the production potential of the country, every possible saving of all types of resources and improvement of the quality of work at the 26th CPSU Congress were named among the main conditions for the solution of the main task of the 11th Five-Year Plan--the further growth of well-being of the soviet peoples.

Elevation of the level of production by the development of science and acceleration of scientific and technological progress, it was noted at the 6th Plenum of the CP Georgia Central Committee, which discussed the tasks of the party organization on the concentration of efforts in the further development of science and acceleration of scientific and technological progress in the national economy of the republic, is the most important party matter in the contemporary stage. Special importance is attributed to the ability of party organizations to coordinate, concentrate and direct the efforts of scientific and production collectives toward achievement of the final tasks, the final results.

And this is no accident. On the path of further reinforcement of the connection of science with production certain complexities, at times of the purely psychological level, must be encountered. On the one hand, up to now among some scientific workers there has been the concept of applied research as something secondary in relation to "pure" science. On the other hand, production workers do not always sense need for creative and business-like contacts with scientific research subdivisions.

How is this Gordian knot to be cut? We have proceeded along the path of organization of scientific production complexes [nauchno-proizvodstvennyy kompleks--NPK]--one of the new forms of integration of science with production. The prerequisites for the formation of an NPK at our enterprise were, firstly, the presence of scientific and technological subdivisions, the activity of which is directed toward the implementation of purposive programs; secondly, the creation of a single material and equipment base and productive capacities, both for the performance of experimental work and for the issuance of series production; thirdly, the need for

[illegible] control [illegible] and [illegible] inspection of the production [illegible] all stages of the cycle "development-production."

[illegible] has been [illegible] reflected also in the structure of the party organization. We have also adopted such a form of [illegible] party organization in the NPK have been [illegible] from the beginning.

The [illegible] and party approach to the question of [illegible] of scientific and technological progress has given positive results. In comparison with the years of the [illegible] Five-Year Plan, today the cycle "development-production" has been shortened by [illegible] months. At the end of the 11th Five-Year Plan [illegible] the cycle [illegible] by a factor of [illegible]. The [illegible] of [illegible] the technological [illegible] of the plant permitted improving the quality of [illegible] production and contributed to [illegible] of the qualifications of both development and production people. At the same time the work experience of the NPK [illegible] a need for further improvement of the structure and form of NPK control with consideration of the material incentive in the development and introduction of new [illegible].

Side by side with the NPK, a scientific-production laboratory [illegible]—NPL is functioning at the enterprise. It combines a scientific laboratory and a production section. Five years experience of its work has confirmed the effectiveness of this form of collaboration of science with production, which permits operatively solving problems in the introduction of new technology into production.

In the aggregate of measures to accelerate scientific and technological progress, much importance is attached to the introduction of progressive methods of labor organization. Basic for us in this direction are the resolutions of the CPSU Central Committee and the CPSU Central Committee and the USSR Council of Ministers on [illegible] improving and intensifying the effect of the economic mechanism on increase of the effectiveness of production and work quality. We are giving special attention to the development of democratic principles in the control of production, to the advancement of the creative initiative of labor collectives, realizing the paramount importance of the wide application of collective forms of labor organization.

The party committee has emerged as the initiator of transformation of the brigade form of organization and stimulation of labor into the main form of control at our enterprise in the 11th Five-Year Plan. A [illegible] has been created and is functioning, [illegible] organizational and methodical leadership of the work of [illegible]. A council of brigadiers, created at the enterprise, is a [illegible] organ of control, working on principles of [illegible] examination and discussion of questions of the production and activity of the collective in close contact with party and social organizations.

At [illegible] the enterprise [illegible] brigades have been created which include about [illegible] percent of the total number of workers. The introduction of the brigade form of labor organization has permitted strengthening labor and production discipline, has contributed to [illegible] in workers of a feeling of mutual understanding and mutual assistance, has improved the quality of production [illegible] and increased labor productivity.

In [illegible] with [illegible], [illegible] gradually [illegible] the number of [illegible] and [illegible] have been formed.

In [illegible] the [illegible] of scientific and technological progress [illegible] work on the basis of automated planning systems. The use of such systems [illegible] possibilities new in principle for the development and production of new technology and ensures a qualitatively new level of organization of [illegible] and feedback between science and production. The system of automated planning of [illegible] developed at the enterprise [illegible] the development of plans, [illegible], the [illegible] in principle [illegible] the application of methods [illegible] different from machine methods. This system permits accomplishing the planning and manufacture of high-quality technological equipment and makes it possible to effectively and practically [illegible] the cycle "research-development-production."

The party committee has developed a five-year plan of organizational-party and [illegible] measures to ensure the realization of a complex program of scientific and technological development of the enterprise. In that the emphasis is on the achievement by the enterprise of above-average limits in the basic technical and economic indicators by the end of the 11th Five-Year Plan.

The [illegible] rates of growth are considerably outstripping those planned for the 11th Five-Year Plan. [illegible] importance is acquired by the material [illegible] of production of output above the plan. In that connection we attribute [illegible], if we have not say decisive importance, to the saving of materials and energy resources. At the enterprise a specific program of actions in that direction has been developed; its fulfillment is monitored by a commission for monitoring the activity of the administration in the area of saving of materials and energy resources.

Special attention is given by the primary party organization and its lower sections to the quality of [illegible] production. Although its share in the total quantity [illegible] and [illegible] presented [illegible] percent, this does not mean that everything is in order with us with the quality of production. [illegible] in this direction, and the party organization is [illegible] personnel.

[illegible] electronics, which has emerged as a result of a merger [illegible] of science and technology in general requires highly qualified scientific, technical, engineering and working personnel. And [illegible] important that at the Physics Faculty of Tbilisi State University a [illegible] has been created with well equipped laboratories, fitted out with [illegible] from among the leading specialists of the enterprise.

[illegible] engineering and technical workers are engaged in the [illegible] of Tbilisi State University. A large place in enhancing the qualifications of specialists and in the matter of exchange of experience [illegible] of workers to enhance the qualifications at the leading [illegible] of the country. The [illegible] of young scientists and specialists also [illegible].

The approach [illegible] formation of a reserve for advancement to management positions in effect at [illegible] permits having at one's disposal a completely real basis for planned and purposeful preparation and verification in the practice of future managers. The monitoring of the activity of the administration as regards the appointment, selection and training of personnel, [illegible] preparation of a reserve of specialists is accomplished by the corresponding commission under the party committee [illegible] production managers [illegible] will be able to take into account [illegible] the socio-political educational aspects, [illegible] progressive toward people, toward their needs and questions and serve as an example in work and life. It is important, it was noted at the November 1982 Plenum of the CPSU Central Committee, to properly arrange the personnel so that in the decisive sections stand people politically mature, competent, having initiative and organizing ability and feeling for the new, without which it is impossible in our time to successfully conduct contemporary production. This position is especially urgent for us, the collective where there occurs a close union of science with production. And we will be guided by this in our everyday activity.

[illegible]
CSO: [illegible]

CONTRIBUTIONS OF ACADEMIC INSTITUTES TO DEVELOPMENT OF NEW TECHNOLOGY IN THE GEORGIAN SSR

Tbilisi ZARYA VOSTOKA in Russian [illegible] p 2

[Article by Il'ya Kobakhidze, [illegible] of the Institute of Economics and Law, GSSR Academy of Sciences, candidate of economic sciences]

[Text] In recent years special attention has been given to increasing the economic effectiveness of scientific developments. In the last five-year plan alone the economic effect from the introduction of the results of scientific research of institutions of the Georgian Academy of Sciences amounted to over 100 million rubles, which is above the indicators of the 9th Five-Year Plan. A considerable economic effect has also been obtained from the introduction of work during the first 2 years of the 11th Five-Year Plan.

In addition, as was noted at the [illegible] Plenum of the Georgian Central Committee CP in the course of many years science in the republic has developed somewhat one-sidedly, apart from the practice of economic and cultural construction. Inadequate attention was given to the practical yield of science, as a result of which a definite gap formed between the results of basic research and their inadequate introduction into practice. To markedly accelerate scientific and technological progress, side by side with intensification of basic research, the development of progressive technologies, management complexes and systems of machines and mechanisms and new materials are becoming the leading direction in the activity of academic institutes of the republic. Their creation and the main thing, their rapid introduction into practice require concentration of scientific research, more effective integration of science and production, the further development and intensification of a program-purposive approach and the formation and accomplishment of purposive complex programs.

The role of scientific-technological programs, sectoral and regional programs is being enhanced. The transition to program-purposive planning of realization of the achievements of science and technology in the republic was already begun in the 10th Five-Year Plan, when 26 scientific-technical programs were developed. Use of the program-purposive method of planning scientific investigations permitted concentrating forces on the most promising and important scientific directions. Starting from the tasks of economic and social development of the republic, in the 11th Five-Year Plan a number of purposive programs have been developed. Among them an important place is occupied by [illegible] programs aimed at the solution of major intersector problems in the area of increasing the efficiency of

of production, a Food Program, a complex program for the development of production of consumer goods, a program for increase of the efficiency of use of the transport complexes of the republic, the purposive program "RASU" of Georgia, which contemplates further improvement of the organization of control of the national economy, etc.

The scientific institutions of the Georgian Academy of Sciences participate in the implementation of programs of union and republican levels. The development of a complex program of scientific and technological progress for the Georgian SSR for the period to 2005 is being completed. The rates of scientific and technological progress have been accelerated and the intensification of production has been contributed to by the implementation of purposive programs to increase the efficiency of extraction and complex development of manganese ores of the Chiatura deposit, mechanization and reduction of manual labor in the national economy of the republic and complex processing of production wastes.

In the development of new types of machines and equipment an obligatory requirement is also reduction of their specific consumption of materials. Without observance of that condition new articles must not go into production. At the November 1982 Plenum of the CPSU Central Committee and the 11th Plenum of the CP Georgia Central Committee there was emphasis of the need for efficient use of material and labor resources. And if the observance of a regime of economy is a task more organizational, then the creation of economic technologies, of contemporary mechanisms and equipment, of new materials, is a task above all scientific. In that matter the scientists of the Academy of Sciences of the republic already have a definite scientific reserve. In the scientific institutions of the academy a number of investigations and developments directed toward the achievement of economies of labor, material and energy resources are being carried out.

Academic institutes of the republic are successfully working on problems connected with implementation of the Food Program. In its solution an important role can be played by biotechnology, to the problems of which great attention is given in the Institute of Plant Biochemistry of the Georgian Academy of Sciences. A number of developments of great national economic importance have already been completed. The study of the action of oxidative enzymes during the processing of plant raw material, in particular during tea production, has permitted developing effective technological methods of obtaining dry concentrates of tea. The technology was developed jointly with collectives of the Institute of Biochemistry imeni A. N. Bakh of the USSR Academy of Sciences and the "Chayprom" Production Association. In the same institute a carotinoid preparation has been created from a mutant of bacteria; an industrial technology for obtaining that preparation has been developed. Use of the preparation in the form of a feed additive during the feeding of birds gives a considerable economic saving. In 1983 the construction of an experimental factory for obtaining carotinoids is being started.

In work on problems connected with implementation of the Food Program, institutes of the Academy of Sciences of the republic of a technical profile also are participating.

The successful implementation of progressive, complex programs will be determined to a great extent also by the activity of social scientists, who are called upon to make maximum use of the economic and social features of growth of the efficiency of social production. Special attention is being acquired today by the

development and implementation of scientifically substantiated proposals on ways to further increase labor productivity, perfection of the branch structure of social production and the mechanism of control of scientific and technological progress, optimization of the agro-industrial complex of the republic. The activity of specialists of the Institute of Economics and Law of the Georgian SSR Academy of Sciences has been directed toward the solution of these problems.

Of the work done in 1982 note should be made of the development of the socio-economic aspect of the complex program of scientific and technological progress of the Georgian SSR in the long range prospect ot the year 2005. The institute participates in the development of economic questions of the Food Program of the republic. Much attention is given to the investigation of economic and legal aspects of intensification of economy and the regime of economy, reinforcement of labor and productive discipline and increase of responsibility on all levels of administration. The results of conducted investigations are realized in scientific reports, memoranda and recommendations, prescribed in directive and economic organs. In 1982 alone more than 30 such memoranda and recommendations were presented.

The process of introduction of scientific developments remains too slow, and at times painful. Only 20-30 percent of scientific works reach introduction; the rest is either not used or is introduced so slowly that right after introduction it seems to have fallen behind the world level. Major hindrances to the wide introduction of achievements of science and technology are departmental separateness, indifference toward the proposals of scientists on the part of various ministries and departments. In connection with that, it is thought that the time has come to adopt a state-wide standard document in which a clear determination will be made of the order of presentation and consideration of recommendations of science, the introduction into the national economy of the results of concluded scientific research and experimental design work. The course of the implementation of achievements of science and technology must be regarded as the most important indicator of the activity of enterprises.

One of the reasons for the slow use of scientific achievements in production is the transmission by scientific organizations to production of undeveloped specimens of new technology without thorough checking, without thorough testing. This happens because in the composition of scientific institutes with a practical profile there are absent or very weak design-technological subdivisions for the creation of leading examples of new technology. The situation is deepened still more by the fact that on the structure of industrial enterprises, as a rule, there are no strong subdivisions, where it would be possible to organize series output of new production. Starting from this, the most important task is the intensification of design and technological services in the composition of scientific organizations and at industrial enterprises.

For better use of the results of scientific investigations in the national economy of the republic, intensification of direct connections of scientific institutions with production in the republic, a new form of integration of science and production, based on the principle of partnership, has been generated and is being developed. This form of reinforcement of the contacts of scientists with production men was given very intent attention at the 6th Plenum of the CP Georgia Central Committee. Partnership agreements are being concluded between scientific organizations

and enterprises for the purpose of introducing available scientific results into production, the obtaining of economic effect and subsequent stimulus of participants in the contract.

Thus the scientists of the Institute of Physical and Organic Chemistry of the Georgian Academy of Sciences have concluded a partnership agreement with the agro-industrial associations of Kaspskiy rayon of the Georgian SSR. Serving as the basis for conclusion of a partnership agreement were investigations and experiments conducted by the institute. It was established that the introduction into the soil of a special very cheap preparation on the basis of natural zeolites --clinoptilolite tufs, a deposit of which is found in Kaspskiy rayon, leads to a considerable increase of the yield of corn, increase of the biomass and a saving of mineral fertilizers. It is proposed to use the given preparation also to increase the yield of beans.

The Institute has concluded partnership agreements also with an agro-industrial association of Gardabanskiy rayon and the "Gruztoplitsa" Production Association. Partnership of the scientific research institutes and enterprises contributes to the material stimulation of workers of scientific institutions and enterprises, and that, in turn, permits bringing scientific research to final results. The possibility is created of reinforcing the material and technological base of scientific institutions through resources obtained as a result of the partnerships. The introduction of work done by way of a partnership must assure the obtaining of an economic effect calculated during conclusion of the agreement. Since the economic effect obtained from introduction of the results of scientific research is a complex sum of the activity of scientific organizations and enterprises, it must be distributed among the partners. The distribution of the effect evidently must be made on the basis of calculation of the so-called share participation of each partner. The transition to partnership relations of academic science and production requires solution of a number of questions connected with the financing and material stimulation of that work, in connection with which a need arises for the development of substantiated proposals on changes of normative documents approved by the union organs.

The conducting of work on partnership principles is inseparably connected with the correct determination of the economic effectiveness. This presents higher requirements for quality and substantiatedness of calculations of economic effectiveness of research and developments in academic scientific institutions. Evidently, it is precisely for this reason that the proposal of the Ukrainian SSR Academy of Sciences on the creation of an inter-republican coordination council on methodology and organization of economic evaluation of scientific research in the academies of sciences of the union republics should be supported.

Increase of the effectiveness of scientific research will depend on many factors. An important factor is the undeviating fulfillment of the requirements of the party for the reinforcement of discipline, improvement of the style of work and organization of the labor of scientific workers. It is necessary to strive for a new approach also to the attestation of scientists. Their scientific production must be evaluated in principle, and not formally, and working time must be used with maximum advantage for the work.

Scientific research, both basic and applied, is subordinated to the interests of further development of the economy. It is precisely for this reason that it is

important to persistently search for ways to enhance the effectiveness of output of collectives of research institutions. This will make it possible to reinforce the role of science in the intensification of the national economy and contribute to the solution of tasks in the acceleration of scientific and technological progress.

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WORK OF ESTONIAN ASTROPHYSICS AND ATMOSPHERIC PHYSICS INSTITUTE DESCRIBED

Tallinn NOORTE HÄÄL in Estonian 12 Apr 83 p 2

[Article by Juhan Toomsoo: "Further Than The Farthest Star"]

[Text] Up from the ground, past trees and clouds, beyond stars and galaxies--this is the research field of Tõravere scientists. Hardly another observatory in the world is located so close to the edge of a field, in the middle of crops; hardly anywhere would research concerned with soil fertility be conducted along with all that is far and interesting.

It is the established scholarly tradition that joins within the Institute of Astrophysics and Atmospheric Physics of the ESSR Academy of Sciences the research of our astronomers--the sectors of experimental physics, theoretical astrophysics, galactic physics--and that of our atmospheric physicists--the sectors of cosmic research, cosmic radiometrics, and atmospheric physics. A field of science, a scholarly cadre and machinery have developed at Tõravere. Tõravere has a place in the scholarly life of the USSR and perhaps of the entire world. The scientists here have participated in scholarly projects on all continents, to include Antarctica, they have attended great congresses of the scientific world, they have worked on several cosmodromes, they have published in many of the world's leading scholarly journals. Tõravere is known, it is recognized, its scholars have been the winners of several scientific prizes.

For example, scholars from two research fields received the latest ESSR prizes. Jaan Einasto, Urmas Hand, Jaan Jaaniste, Mihkel Jõeveer, Ants Kaasik, Enn Saar, Erik Tago, and Jaan Vennik of the galactical physics sector were rewarded for work dealing with hidden matter and the large-scale structure of the universe. Agu Laisk and Vello Oja of the atmospheric physics sector received the prize for participating in research into the mechanics of leaf photosynthesis and factors bearing on its intensity.

Activity at Tõravere is considerably broader than can be described in two interview extracts. There will be more later on.

Jaan Einasto, corresponding member of the ESSR Academy of Sciences, chief of the galactical physics sector: Currently our basic work consists of

research into the structure of the universe. This includes the location of galactic systems in space, the characteristics of these systems, the distribution of intergalactical matter, etc.

We began with research into galactical characteristics. This in turn was based on research into our galaxy, but that is already a traditional research problem that extends back into the early years of our observatory.

Research into the structure of the universe is closely tied to the basic problems of modern physics. It turns out that the information we gather about the structure of the universe gives us an idea about the origins of galaxies. This in turn depends on the structure and characteristics of a young universe. These are in turn closely linked to the fundamental problems of the physics of elementary particles. The only ·lce to verify the physical theories is in cosmology. Very many quantitative stages separate the conditions that can be created experimentally from those that existed in the universe in its early stages, its "first moments," so to say.

We are cooperating with other teams in the USSR and abroad, above all with Academician Yakov Zel'dovich's team in Moscow that is dealing with both the physics of the early universe and the theory of the origin of galaxies. Zel'dovich's theory that assumed the existence of a certain structure in the universe did not have many supporters initially, 10-15 years ago, since the observations made at that time did not prove it. At that time three basic facts were known about the universe--its expansion, the existence of background radiation, and its chemical composition; these were the basis for the so-called Big Bang theory.

By now a whole generation of telescopes in very good locations have come into use, as have supersensitive detectors, 100-1000 times more sensitive than previous ones. The additional information leads to the conclusion that the universe is not an accidental, unstructured mass of galaxies, but that there is a fixed galactical placement and a regular distribution of galaxies in space. Galaxies are combined into galactical systems, these join in groups of galaxies, clusters, these in turn form long "chains" that merge into nets. The nets together form a common spatial structure.

This unexpected finding about the structure of the universe was discovered barely five years ago, and out teams did make its contribution felt. But it must be said that our work would have been impossible without the direct cooperation and observation data obtained from other research teams, mainly from the U.S., partly from the European South Observatory that is located in the southern hemisphere.

We are cooperating with both theoreticians (the Moscow School) and observers. We have been in the role of interpreter and have attempted to create our own concepts and theories through thought and calculations. But this alone is not enough. Looking to the future it is necessary that our research continues in the theoretical direction, but at the same time a development of our own observation base is also needed. A situation where we are primarily using the fruits of others' observations is not promising. Unfortunately,

the capacities of Töravere are limited. We have gathered quite a lot of data, but this is still infinitesimal when compared to data needed to solve our problem. A better observation facility in a better location would move us forward. This does not mean that construction of Töravere was useless. Without it we would not have had contemporary astronomy, and there are also other fields of research where successful progress is possible in existing facilities.

The systems for observation data processing, i.e. the existing calculating technology, also require constant updating. The volume of computations in modern astronomy is huge and this is unavoidable if one wants to maintain standards. We have succeeded in staying in the frontlines after a small breakthrough in 1974 when for the first time we received wider notice in the world of astronomy.

Old laurels will not last, since research into galaxies, the number of observation cosmology teams in the many research centers of the world has multiplied.

Juhan Ross, doctor of physics, chief of the atmospheric physics sector: In the last decades the main attention of the atmospheric physics sector has been focused on the problem "sun and plants." More precisely--we are interested in how plants use solar radiation, and how solar radiation affects the plants' yield. In the last ten years we have dealt with a new problem--how to use solar radiation reflected by plants to investigate properties of plant cover by distant observation. We are interested in how plants fare in drought, what are plant temperatures and water usage, and how all of these factors affect yields. This research field is quite broad and touches several disciplines. A solution to the problem requires knowledge of atmospheric physics, the optical characteristics and biology of plants, and the optical and physical properties of soils. In addition, a suitable mechanism must be constructed to investigate all these properties. It could be said that we are working in a new discipline that might be called biogeophysics.

We are investigating the relationship between solar radiation and plants, how solar radiation is transformed in the plant cover and in the soil into other kinds of energy, and how plants utilize these other types of energy, primarily in the course of photosynthesis. It is generally known that his energy is expended for plant growth, making of new organic compounds, and the distribution of these compounds to the various areas of the plant. As a result of all these processes the plant grows, bear fruit, and we receive our daily bread. In short--the bread we eat is nothing but solar energy collected into chemical substances. The techniques for research into this process must be multifaceted. Plant research requires both laboratory and field experiments. We have constructed a complicated apparatus, called a miniphytotron, for laboratory experiments. A plant grows in its chamber and we observe the growth of its roots, leaves, and stems. The growth conditions can be regulated. We can adjust radiation, temperature, air humidity, solid humidity, and nutrient supply to the soil. We are attempting to describe mathematically, to construct a model of the effect of these variables on plant growth.

Our sector has also created a unique apparatus to investigate photosynthesis. It allows us to investigate the dynamics of photosynthesis with a very great amount of time differentiation. With the help of these dynamics we can construct theories about the photosynthesis process in plant leaves.

Our field experiments have recently included research into the optical properties of plant cover both on the ground and from the air--from airplanes and helicopters. The completion of a new complicated device, a "flying laboratory" to permite observations from an Il-14 airplane has become acute. The new device should permit very rapid measurements of the reflection of direct solar radiation from leaves within various segments of the spectrum. this information is needed to interpret measurements made from space, and to determine the earth's natural resources from these measurements. We could observe pollution and the dynamics of crop ripening in various areas of the earth, and make prognoses regarding yields over wide areas from space. The ancestors of such a device have functioned in our planes and helicopters for some 10 years.

Work to date has shown that various forms of plant cover can quite easily be classified according to their reflective spectra. The picture is very dynamic and depends greatly on time and on the structure of the plant cover (the tree distribution in a forest, the kind of branch and treetop structure, and the species of trees). By the way, in the course of the cooperation between the USSR Academy of Sciences and the Finnish Academy of Sciences we are participating in research dealing with energy and mass exchanges and the ecophysiology of coniferous forests. Field work is underway in the Karelian ASSR and Finland. There is interest in our work in various parts of the world, and this urges us on.

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UZBEK SCIENTIFIC INTELLIGENTSIA UNDER DEVELOPED SOCIALISM

Tashkent OBSHCHESTVENNYYE NAUKI V UZBEKISTANE in Russian No 2, Feb 83 pp 14-19

[Article by N. Mutalov: "The Scientific Intelligentsia of Uzbekistan Under the Conditions of Developed Socialism (Makeup and Growth Dynamics of Scientific Cadres)"]

[Text] In our day, science has become an organic part of social life. This is an objective process conditioned by the whole course of development of society, especially in the period of mature socialism. The CPSU in its policy proceeds from the fact that the problems of creating a material-technical base for communism, improving social relations and forming the new man cannot be successfully solved without the active participation of all contingents of the Soviet intelligentsia, particularly the scientific. For this reason, the party and the government constantly maintain within their field of vision questions relating to the further improvement of selection and training of scientific and scientific pedagogic cadres. And it is perfectly natural for scientific personnel to constitute one of the fastest growing social groups of the Soviet intelligentsia.

"Our scientists," it is noted in the materials of the 26th CPSU Congress, "play an important role in the realization of the scientific-technical revolution and in the development and realization of special-purpose social-economic complex programs."[1]

The USSR is one of the leading powers in regard to the number of scientific cadres. One-quarter of the world's scientific workers are concentrated in our country. Scientific cadres have also been growing steadily in Uzbekistan. In 1980, the number of scientific workers (including scientific pedagogic cadres of VUZ's) in Uzbek SSR amounted to 35,288 persons, including 939 doctors and 12,992 candidates of sciences.[2] Uzbekistan has to its credit 2.6 percent of the USSR's scientific workers. A total of 23.8 percent of the doctors of sciences are concentrated in the scientific-research institutes of the republic, 53.8 percent in VUZ's and 22.4 percent in other organizations and institutions.

The absolute and relative growth of cadres of the highest qualification, that is those with academic title and degree, is especially characteristic.

Table 1*

Indicators	1965	1970	1975	1980
Total of scientific workers (including scientific-pedagogic cadres)	16,329	25,244	30,835	35,288
including:				
doctors of sciences	314	494	745	939
candidates of sciences	3,879	6,907	10,505	12,992
academicians, corresponding members of UzSSR AS	73	102	96	108

* "Narodnoye khozyaystvo Uzbekskoy SSR v 1980 godu" [Uzbek SSR National Economy in 1980], p 26.

As can be seen from Table 1, the number of scientific workers without academic degrees during 1965-1980 better than doubled and of those with academic degrees better than tripled.

The tasks of communist construction, the growing needs of socialist society and promotion of the role of science under the conditions of the present scientific-technical revolution make necessary the further, first of all qualitative, growth of scientific cadres.

The high growth rate of scientific cadres is a necessary condition of the optimal functioning and development of socialist society. They are determined by the nature of socialism, the content of its aims, growth of the motive forces of its progress, social and ideological unity of socialist society and the process of converting science into a directly productive force and into a leading factor in the development of production.

The basic functions of the scientist are cognition of the surrounding world for its transformation and creation as well as propaganda and dissemination of knowledge among the broad strata of the population. The developed socialist society ensures favorable conditions for the realization of creative opportunities in the different spheres of social life. Highly qualified cadres, especially doctors of sciences and professors to a large extent determine the rate of science's progress, since they are called upon not only to help the national economy of the country in the solution of problems of the present day but also to pave the way for tomorrow and to more deeply cognize and put at the service of the people the developmental laws of nature and society, to more broadly and effectively utilize available resources for the further vigorous rise of the national economy and to increase the material and spiritual wealth of the Soviet people.

In Uzbekistan, doctors of sciences toward the end of 1970 comprised 2.0 percent of all scientific personnel while candidates of sciences made up 27.4 percent and persons without an academic degree--70.6 percent. By the end of 1980,

Table 2

Sciences	Number of doctors of sciences, including (in parentheses) women	Average age of persons defending doctoral dissertations
Physico-mathematical	54(2)	42
Chemical	59(5)	44
Biological	84(15)	47
Geological-mineralogical	54(5)	46
Technical	68(3)	47
Agricultural	48(1)	51
Hisstorical	71(8)	48
Economic	65(2)	49
Philosophic	42(4)	44
Philologic	94(5)	48
Geographic	12(3)	47
Juridical	24(2)	49
Medical	268(47)	44
Veterinary	10(-)	43
Art criticism	8(2)	51
Psychology	2(-)	48
Pharmaceutics	4(1)	46
Pedagogy	5(-)	55
Total	972	46

the relative share of persons possessing the academic degree of doctor of sciences has reached 2.7 percent and of candidate of sciences--36.8 percent. This has a favorable effect on the level and effectiveness of scientific developments of Uzbekistan's scientists whose work occupies a worthy place in all-union scientific research.

Age data of persons defending doctoral dissertations for individual sciences during 1960-1980 are interesting (Table 2).

Analysis of these data shows that doctoral dissertations in physico-mathematical and veterinary sciences are defended at a younger age and those in art criticism, the agricultural and pedagogic sciences are defended at an older age. The average age of women defending doctoral dissertations is 47 for all the sciences. In recent years, there has taken place a certain reduction of the average age of persons defending doctoral dissertations (Table 3).

Let us also note that the average age of persons defending doctoral dissertations in the natural sciences is lower than among representatives of the social sciences.

Society is naturally interested in a reduction of the average age of doctoral sciences, inasmuch as, other conditions being equal, this ensures higher effectiveness of their scientific work and a larger volume of scientific output.

Table 3

Sciences	1960-1970	1970-1980
Technical	47	41
Physico-mathematical	46	42
Chemistry	46	42
Geography	48	42
Medicine	45	45
Biology	48	45
Geological-mineralogical	48	46
Agricultural	55	49
Philosophy	42	46
History	48	48
Economics	50	48
Philology	47	48
Juridical	50	53
Veterinary	42	44
Art criticism	58	46
Pedagogy	60	55
Psychology	--	49
Pharmaceutics	40	53
	48	47

At the same time, the existing difference in the average age of those defending doctoral dissertations in the natural and social sciences has its own objective reasons.

Practice shows that in the field of the natural sciences the greatest effectiveness in the formulation and solution of scientific problems is attained by a researcher who is 30-40 years old. In the social-sciences, however, more extended study is required of them due to the complication of the processes of social development. Consequently we consider the optimal age for defense of doctoral dissertations in the social sciences to be 35-45 years.

It should be emphasized that in the development of science an increasingly ponderable contribution is being made by women. By 1980, their number in Uzbekistan had reached 12,880 persons, including 107 doctors and 3,287 candidates of sciences.[3] Nonetheless it should be mentioned that among scientific personnel in the USSR as a whole women who are doctors of sciences constitute 0.4 percent and in Uzbekistan--0.3 percent. Thus in regard to this indicator the republic still lags behind the average union level. For this reason special importance is attached to the training of highly qualified scientific cadres--doctors and candidates of sciences--from among women in the republic.

A most important source of fresh forces for scientific and scientific pedagogic cadres is that of postgraduate study--a purposeful and organized form of training of cadres for the most needed specialists. The party and the government devote much attention to the further improvement of the work of postgraduate study of VUZ's and scientific institutions.

The number of postgraduate students in Uzbek SSR in 1975 reached 3,001 and in 1980-- 3,311 persons. Of that total 1,576 were studying in scientific institutions and 1,735 in VUZ's.

Scientists of the UzSSR Academy of Sciences--the headquarters of the republic's scientific thought--exert a significant influence on the economic and cultural development of Uzbekistan. In 1981 a total of 4,029 scientific personnel worked at the UzSSR Academy of Sciences. Of these 230 were doctors and 1,626 candidate of sciences, solving important scientific and national-economic problems. The Academy of Sciences unites and directs the creative efforts of the republic's scientists for the development of both theoretical and applied sciences connected with the growing requirements of Uzbekistan's national economy and culture.

The UzSSR Academy of Sciences is a large scientific-research organization that includes a ramified network of scientific-research institutions. It exercises general supervision over the development of various branches of knowledge in Uzbekistan and carries on training of scientific cadres of the highest qualification. At the present time, the UzSSR Academy of Sciences is participating in the development of 50 all-union and regional complex scientific-technical programs. More than 30 nations and nationalities of our country work in its subdivisions.

The principal direction of the scientific-research work of Uzbekistan's scientists is working out of problems of cotton growing, first of all the development of new fast-ripening, high-production varieties of cotton resistant to diseases, the use of essentially new agrotechnical techniques and means for its cultivation, the creation of a complex of high-efficiency machines providing mechanization of cultivation and harvesting of cotton as well as problems of increasing the production of grain crops, horticultural products, higher productivity of animal husbandry, greater effectiveness of developments relating to irrigation, improvement of the operation of irrigation systems, the introduction of new methods of watering land, rational economical water use and a number of other important problems stemming from the USSR Food Program.

It was emphasized at the 26th CPSU Congress that a close connection between science and production is an urgent requirement of the time. Success depends not only on the degree of completion of scientific developments but also on mutual interests in their introduction and contacts of scientists with production people. Expended resources must yield profit. In the UzSSR Academy of Sciences each ruble invested in the development of sciences provides a return in excess of 5 rubles.[5]

In the light of what has been said, the influx of specialists from production into science is of topical importance.

A major contribution is being made by sectorial institutes to the development of the national economy.

In connection with the adoption of the food program, the May (1982) plenum of the CPSU Central Committee pointed out the need of further development of

scientific research and faster introduction of their results into production in all sectors of the agroindustrial complex, the creation of new effective plant protective agents against pests, diseases and weeds, growth regulators and other preparations for agriculture.

The republic's scientists enthusiastically responded to this call.

At the Central Asian Institute for Protection of Plants, a biological method is being developed for protection of plants against diseases, which is successfully used against diseases of the cotton plant. Just in 1981, 1.8 million hectares of cotton sowings were protected with the biological method. During the years of the 10th Five-Year Plan, an economic gain of 109 million rubles was realized by the institute as the result of introduction of scientific research work into production. For each ruble spent on research work, a profit of 29 rubles was obtained.[6]

One of the main tasks is to secure an all-round rise in the effectiveness of scientific work in higher school. At the beginning of 1981, the republic's VUZ's had 20,354 scientific personnel, of which 506 were doctors and 7,405 candidates of sciences.[7] This is a lot of manpower able to conduct effective scientific work and to successfully inntroduce its results into practice.

In the strengthening of ties of VUZ's with production, an important role is played by the conclusion of long-term complex contracts on scientific and technical cooperation. At the present time, such contracts have been concluded by Uzbekistan's VUZ's with many organizations and enterprises.

Just in 1978, the scientists of Tashkent State University imeni V.I. Lenin on the basis of their research turned over to various organizations 12 developments with a total economic effect in excess of 1 million rubles and in 1979--11 developments with a total economic effect of more than 4,041,000 rubles.[8]

The scientists of Tashkent Polytechnic Institute imeni A. Beruni completed in 1981 research investigations on 102 themes. Of these, 96 were worked on the basis of economic contracts and also 6 on the basis of state budget subjects. The economic effect comprised 7.3 million rubles solely for 67 developments turned over for introduction into production, a portion of which has already been so introduced.[9]

The cooperation of VUZ's with enterprises, retained with contracts of complex scientific-technical cooperation, yields mutually profitable results. The higher educational institution acquires a broad field of scientific activity, while the enterprise with the help of scientists solves current social, economic and scientific-technical problems and introduces in a timely way the results of research into production.

Scientific personnel have an important role not only in the creation of a material-technical base for communism but also in improving social relations, development of culture and the spiritual character of the Soviet people and in the forming of the new man. Participation in the communist education of

workers constitutes a very important sphere of work of the scientists of Uzbekistan. Uzbekistan's scientific intelligentsia serves as an active bearer of communist ideals, new culture and the Soviet way of life. It explains to the broad masses of workers the meaning and importance of the party's policy, does much work in inculcating in our people the communist attitude toward labor and socialist property and educates conscientious, active particicpants in the building of communism.

The party sees in the scientific intelligentsia its true helper and solid support. Without the participation of scientists, not a single important measure could be carried out in the field of the national economy and in the spiritual and moral development of the popular masses. The scientists deeply analyze and generalize the practice and experience of struggle for the building of communism; they creatively develop revolutionary theory and conduct an uncompromising struggle against bourgeois falsifiers and anticommunists of all hues.

The plenum of the Central Committee of the Communist Party of Uzbekistan, which convened in September 1982, discussed broadly and thoroughly the question "On Tasks of the Republic Party Organization Relating to the Fulfillment of the Decisions of the 26th Party Congress, Subsequent Plenums of the CPSU Central Committee and Directives of Comrade L.I. Brezhnev on Improving the Effectiveness of Scientific Research and Strengthening the Ties of Science and Production." At the same time, the need was emphasized for further improving the effectiveness of science, speeding up the introduction of its achievements into the national economy and raising the level of organizational and political work in scientific and educational institutions and among labor collectives. There is no doubt that the republic's scientific workers will apply all their efforts and knowledge to the successful fulfillment of the tasks set before them, increasing their contribution to the development of the economy and culture of Uzbekistan and of our entire country.

FOOTNOTES

1. "Materialy XXVI s"yezda KPSS" [Materials of the 26th CPSU Congress]. Moscow, 1981, p 95.

2. "Narodnoye khozyaystvo Uzbekskoy SSR v 1980 godu. Statisticheskiy yezhogodnik" [The National Economy of Uzbek SSR in 1980. Statistical Yearbook]. Tashkent, 1981, p 25.

3. Ibidem, p 25.

4. Ibidem, p 26.

5. PRAVDA VOSTOKA, 24 March 1982.

6. SOVET UZBEKISTONI, 20 November 1981.

7. According to data of the UzSSR Central Statistical Administration for 1981.

8. From reports of scientific-research work of Tashkent State University for 1978 and 1979.

9. PRAVDA VOSTOKA, 23 January 1982.

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